Frontispiece Vol. VII.

R. Parr Sculp.

Trade the Riches of a Nation.

Frontispiece Vol. VII.

R. Parr Sculp.

Trade the Riches of a Nation.

Spectacle de la Nature:

OR,

NATURE DISPLAY'D.

BEING

DISCOURSES

On ſuch PARTICULARS of

NATURAL HISTORY

As were thought moſt proper

To EXCITE the CURIOSITY,

AND

FORM the Minds of YOUTH.

Illuſtrated with COPPER-PLATES,

VOL. VII.

Tranſlated from the Original *French.*

The FOURTH EDITION.

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BRITISH MUSEUM

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Explanation of the Frontiſpiece.

CHARLES V. after the unſucceſsful Expedition of *Tunis*, received a mighty Aſſiſtance from the large Sums lent him by the *Tuggers*, who were wealthy Merchants of *Avſbourg*. They perſuaded him to come and dine with them, and having begged leave of him to burn a Faggot of Cinnamon, in the Room where he was treated, they roll'd up his Bills for Repayment of the Money, and made them ſerve to light the Fire. *Felibien Entretien des Peintres*.

Spectacle de la Nature.

The HABITATIONS of MAN.

DIALOGUE XV.

WHILE one Part of the human Species is employed in preparing our Food and Attire, we are going to view another Part of Society no leſs numerous than the former, taking upon them the Care of preparing Habitations for the Reſt of Mankind. We indeed borrow the Aſſiſtance of the Architect and Maſon, when we have a Houſe to rebuild, or an Apartment that wants to be repaired: But we at the ſame Time act a wiſe Part, in preſiding over the whole, and we acquire a Right to it, by early taking a proper Notice of their Works. This we have daily Opportunities of doing; and often converſing with, and taking Advice of an honeſt Tradeſman, who though he builds his Houſe without any Oſtenſtation and Magnificence, yet does it in Taſte and ſhews as much Judgment in the Diſpoſal of every Part as in the Management of his Expences, is as ſure a Means of improving our Minds, as it is of our ſucceeding in what we undertake. Human Abodes have varied from Time to to Time, according to local Conveniences, and with Relation to the different Genius and Character of every Nation. The firſt Manner of building Houſes ſince the Deluge (for we are perfect Strangers to all Events before it) was the Architecture of the Children of *Noah* in *Gorduena*, (1) where the Ark ſtopt. The Appendices of Rocks, the Caves and hollow Places dug under Ground, were the firſt Retreat of their Families, at this Time much increaſed in Number in that mountainous Land. There they ſheltered themſelves from Rains and ſharp winds, but not from Damp and Obſcurity. The melancholy Situation, and the Barrenneſs of thoſe Regions, which were hardly habitable on Account of the Sands, Chaſms and broken Rocks, of which they were full, drove them over the River *Tigris* into the delightful Plains of *Meſopotamia*. The Want of Stone, or any other hard Matters fit for making themſelves Shelter, taught them how to mould Bricks or ſquare pieces of Clay, and bake them hard, wherewith to lay Strata or Maſonry perfectly even. They bound them together with a viſcous Bitumen which the ſame Country ſtill affords, and which they thickened with Reeds and Straw cut ſmall. That Country, ſo delightful in itſelf became more ſo by the Conveniences which the Art of Building began to procure them, when Providence obliged them to diſperſe themſelves in Colonies from one End of the Earth to the other, leaving them for their Guides the Inſtructions of their Fathers, their own wants, and a few natural Talents.

The birth of Maſonry.

The Building of the Aſiatics.

The Birth of Carpentry.

When inſuperable Obſtacles obliged them to fly from one Country into another, the Woods, which were eaſily found in almoſt every Place, and equally fit to make Pieces of Support and to procure them Roofs and Linings, were the moſt ſolid as well as the moſt pliant Matters that procured to the new Colonies a well ſituated, wholeſome, commodious Habitation, inſtead of the lurking Holes and obſcure Dens which had often ſheltered them in their Peregrinations; and tho' they were at firſt, and for want of Skill, obliged to content themſelves with green Arbours void of Proportion and

---

(1) Now Curdiſtan.

Symmetry, or with twiſted Willows cemented with Clay; they nevertheleſs had there the Benefit of the Day-light, and breathed a very pure Air. Wood took whatever Form they were pleaſed to give it. The Tools they had invented turned it by degrees into Hurdles, Poles, Beams, Joyſts, Boards, Laths, and Pieces of all Shapes and Sizes. The Pliantneſs and perpetual Reproduction of Wood and the Skill of the Hurdler and Carpenter are then the Cauſes to which we are really indebted for the manner of Building, which was moſt univerſal in the beginning, and which has rendered the Earth truly habitable. It is the Uſe of Wood that firſt diſtinguiſhed the Habitations of Men from thoſe of Wild beaſts all over the Earth.

But then, the weakening of Wood after a few Years time, and the juſt Apprehenſion of quickly deſtroying, in a whole Canton at once, this ſo very precious Matter, obliged Men to add, or even as much as poſſible to ſubſtitute to it Clay, Loam, Stone, Slate, and moſt commonly baked Earth where Stone was wanting.

The Buildings of the Gauls.

This ſparing Diſpoſition has often introduced and perpetuated among whole Nations the Faſhion of Rotundos, or circular Buildings of Hurdles, covered with Thatch and Ruſhes, and ending in a Cone like our Ice-houſes. The Hurdler's Work was ſometimes ſtrengthened with a Plaiſtering made of chopped Straw and Loam. A Hole, opened at the Point of this ruſtic Dome, gave vent to the Smoak. The Fire-place, ſomewhat ſunk in the Middle of the Room, and garniſhed ſimply with Wood-coals, comforted the whole Family diſperſed around it. The Fabric of ſuch Buildings and the common Exigencies of Life required only the cutting down of Coppices or other Under wood. It was this Simplicity that did for ſo many Ages together preſerve the immenſe Foreſts with which *Germany* and the *Gauls* were covered. Such was the Architecture of our Forefathers (1); and the Remains of their Way of Building, as well as the Form of their Habitations, is ſtill to be ſeen in the Villages of *Loraine*, *Germany*, and *Poland* (2).

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(1) See Strabo Geogr. l. 4. and Vitruv. l. 2.
(2) See Barclaii Icon Animorum.

Other Nations built their Houſes in a quite different Manner.

The Buildings of the Egyptians.

The *Egyptians*, after having run over and cloſely examined the two Sides of their River, took a Reſolution to fix their Abode in the Plains it moſt fertilized, and to bring thither by the help of Navigation the Stone, Marble, and all other Matters fit to build, which they could no where find but at the farther end of *Africa*. The Plenty of every Thing determined them to fix there, and a national Taſte, occaſioned partly by the Beauty of theſe matters, and partly by the Situation and Diſpoſition of the Country, accuſtomed them to introduce Sublimity in their Architecture. Hence, thoſe magnificent Habitations in Form of Terraſſes and all thoſe lofty Monuments, which muſt have been rendered ſuperior to the Inundations, and indeſtructible to all the Efforts of Water. Wood had hardly any ſhare at all in their Buildings. The Country afforded very little of it; nor would it have been laſting, being ſucceſſively and yearly preyed upon by Water and Air.

The Elegance, that ſhines throughout the Writings of the *Greeks*, is again found in their Architecture, and in all their Inventions. We had from them the fineſt Operations of Geometry, the Correctneſs of Drawing, the ſeveral Orders of Architecture, the beautiful Proportions in every Thing, the Principles of all the liberal Arts.

The *Romans*, leſs civilized and poorer in the Beginning, built their Houſes at firſt with Wood, Earth, and Stubble. We nevertheleſs find a Character of Nobleneſs in their primitive Simplicity: Nay, they arrived perhaps at once at the true Grandeur, ſince they never ſpared any Thing to perfect the Edifices they built for common Utility. In the Time of *Tarquin* the Antient, that is, 600 Years before our Saviour, the whole Soil of their Town was channeled and inwardly traverſed by ſeveral large Canals of Maſonry, which like ſo many Branches of one Trunk terminated in a common Conduit that was arched and acceſſible to the Carts of their Scavengers, that the foul Water of all their Houſes might at any Time be diſcharged into the *Tyber*. This Love of Magnificence and Cleanlineſs, in Point of Works deſigned for the public Utility, was perpetuated through every Age of the Republic,

public, and was ſtill regarded by the firſt Emperors. The greateſt Emulation of the moſt wealthy Citizens was to convey from far wholeſome Water into *Rome*, for the Service of the People: To procure them very ſpacious Buildings where the young *Romans* might ſtrengthen their Conſtitution by bodily Exerciſe: To build and adorn with Statues large Porticos, where the People might at any Time ſtand under Shelter, when they were to make their Purchaſes, or to the End that they might ſtudy the Monuments of the Hiſtory of their own Country there. The grandeſt Enterprize, that ever was attempted by the *Romans*, was not only that of paving, but alſo of maſoning upon ſolid Foundations all the high Roads that traverſed the whole Empire. The Son in Law of *Auguſtus**, who took the Execution of it upon him with ſo much Zeal and Succeſs, was a true Hero; ſince he thereby did a Piece of Service to all Mankind in General.

The Progreſs of Maſonry.

The Inconveniences and Decay of Wooden-buildings brought Maſonry more and more in Requeſt, both for public and private Uſe. Society was a double Gainer by it. Its habitations became more commodious; the Matter of Wood, ſo neceſſary to Navigation, for the dreſſing of Victuals, and for many other Uſes, was conſiderably ſpared. It, nevertheleſs, ſtill came in for a great Share in the Conſtruction of moſt Edifices. It now and then ſupplies the whole Carcaſs, or what they call the Frame of them, which is afterwards filled up with ſlight Maſonry. There is no doing without Wood, when the Diviſion of Stair-caſes is to be made; and it is indiſpenſably neceſſary to tye in the Walls, and to preſerve the whole by the Shelter of the Roof.

When we are either unable or unwilling to lay deep Foundations, we are contented in that Caſe with the Solidity which we find in a wooden Building from the ſeveral Faſtenings and Tyes that out of a great many different Pieces form a compleat Whole; and the Ground being leſs charged with it yields leſs to its Weight than it would do to that of Stone-Maſonry not founded on a firm Bottom.

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* Agrippa.

Piling. Pile-work.

When, on the contrary, we would have a ſolid Foundation upon Quick-ſands, or in a Place where the firmeſt Ground cannot eaſily be attained; it is Wood again that comes in to our Aſſiſtance, and inſures an unſhaken Solidity to the Maſonry, The Piles, which are driven into theſe ſoft Soils by repeated Blows of the Rammer, have their Foot perpendicularly reſting upon Turf, and with their level Heads they ſupport the Weight of an immenſe Edifice. Thus did the Maſon and the Carpenter ſettle their reſpective Provinces: They were then of mutual Help one to another, and never parted afterwards.

The Art of the Smith,

The Smith came next to faſten and perfect the Work of both by ſtrong Tyes and by ſeveral Inſtruments fit to prevent the Inſults of the Elements, or the Violence of Uſurpers. Workmen and Profeſſions were multiplied with the ſeveral Helps we might deſire to have. Many of them owed their birth barely to a Taſte for new Conveniencies. How many Precautions, Machines, and Fabrics altogether different in Iron Work alone? How many other Proceſſes in the ſeveral Uſes of Copper and Lead? How many more for the Conveyance of Waters and the Preſervation of Drinks? What a World of other Contrivances have they not imagined for the bare Diſtribution of Light? The Hurdler and Baſket-maker had at firſt barred the Windows of every Habitation with thin wrought Lattices which admitted the Day, but did not ſtop out the paſſage of the Winds, or inclement Air. The Weaver replaced the Service of theſe Blinds by that of thin Cloths; and the Glaſs-maker, at laſt, ſubſtituted to the Lattices of Cloth, of Alabaſter, or of any other thin Stone, the fine white Glaſs and large Sconces: Inchanting Decorations theſe! and exquiſite Conveniencies, that give an Apartment all the Splendor of the brighteſt Day, and baniſh all Winds from thence, without depriving the Inhabitant of the free Aſpect of his Houſe and the whole Scene of Nature.

Theſe noble Inventions and a great many others had their Birth in Ages, which we are pleaſed to term the Times of Ignorance. Let us do them more Juſtice.

Sound Philoſophy is the Product of all Ages. True Philoſophers are like true Chriſtians, whom we at any Time diſcern by their Fruits. As true Piety declares itſelf by the Regularity of its Faith and the Excellence of its Works; ſound Philoſophy, likewiſe, may be ſaid to have reſided in thoſe Places whence prudent Obſervations and ingenious Machines were handed down to us.

God forbid we ever ſhould be prompted, by our Admiration for theſe beautiful Diſcoveries, to ſtile Creators the Men who formerly made or are now improving them; ſince they have employed or wrought none but Things already created that were excellent in their Nature. Beſides, their very Induſtry is itſelf, as well as theſe Matters, a rich Preſent from the Maker of all Things. However, let us not refuſe them their Due. Theſe are the Men that do real Honour to the human Mind. Thoſe, who did not ſcruple to aſſume the Titles of Maſters and Sages to themſelves, have generally taught us nothing but Words and the Art of diſputing upon *Poſſibilities*. But Artiſts have inſtructed Diſciples, who, like their Maſters, go on from Age to Age with multiplying Conveniences, and producing new Beings for our Service. All is rough and in a bad Condition in the Places where the Architect, the Carpenter, the Maſon, the Joiner and the Smith are but juſt come: And we find, at their going from thence, Symmetry, Harmony, Proportions, Cleanlineſs and Eaſe, on all Sides united with Solidity.

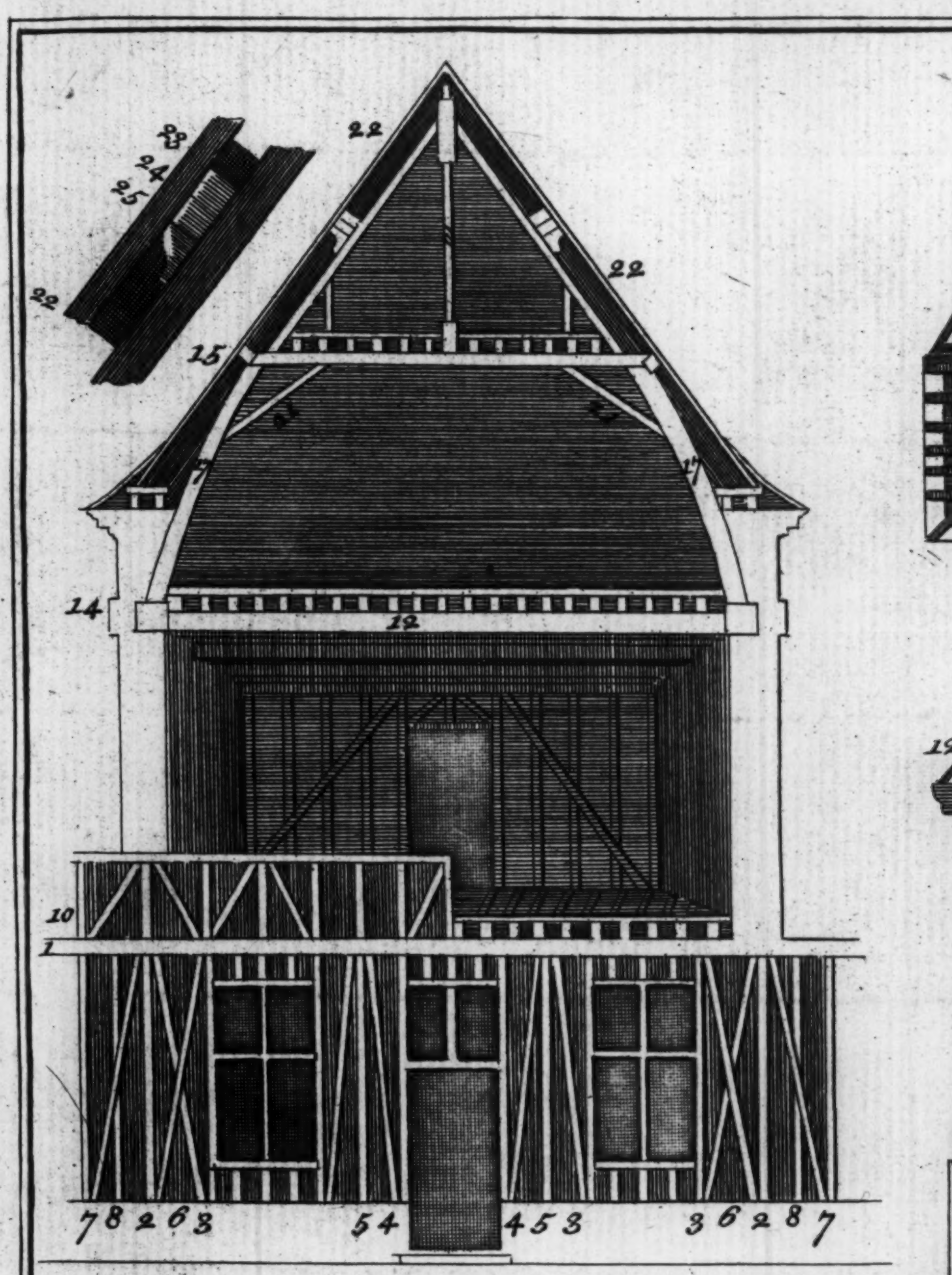
See Jeuſe's Carpentry.

The bare Denomination of all the Pieces which enter into the Structure of the whole Timber-work and Roof of a wooden Building may, together with the Figure of it, give you a firſt and not exact Idea of theſe Aſſemblages of Timber-work which are ſo ſeldom taken Notice of, though no Man ought to be ignorant of them. This firſt Step once made, you never will be able to reſiſt the Deſire of knowing every particular of the Tools that ſerve for the Execution of theſe Works. The Knowledge of the individual Services they all of them do us may open the Mind and inſpire it with a Love for, and a Taſte of Exactneſs and Regularity. Let us begin by what is moſt eſſential. There is no Workman but what will teach you the Reſt, and let you into the whole Secret.

PLATE the FIRST.

The ſeveral Pieces belonging to Carpentry.

A. 1. The Plate; a Piece that terminates a Pannel of Wood and a Partition-wall.
2. Large Corner-Poſts to ſupport the Coines.
3. Braces, by the Sides of the Windows.
4. Door-poſts.
5. Middle-poſts.
6. Croſs-braces, or St. *Andrew's* croſſes.
7. Truſſes, or Half-croſſes.
8. Small diagonal Braces under the Supports of the Windows.
9. Lintels, or Headpieces over the Door or Window.
10. Small-poſts.
11. Small-poſts above the Lintels, and under the Supports of the Windows.
12. Beams.
13. Joyſts; Pieces of Timber that ſerve to ſupport an inlaid-floor.
14. Joyſts, reſting at one End upon the Beam to ſupport the Floor.
15. A croſs Square of Timber that ſupports the Ridge.
16. Pieces of Timber that bear up the Timbers of the Roof, and are mortiſed at the Top of the Ridge.
17. Corbels, Corbets, or Corbits, the Supports of the Roof; ſhouldering without, reſting at one End on the Beam, and bearing up with the other End the Croſs-Quarter of Timber, Numb. 15.
18. The ſame Thing as Numb. 15. to bind in the Corbets.
19. An upright Piece of Timber which together with the Croſs-ſquares, Numb. 15, and 18, the Corbets, and



The Several Parts

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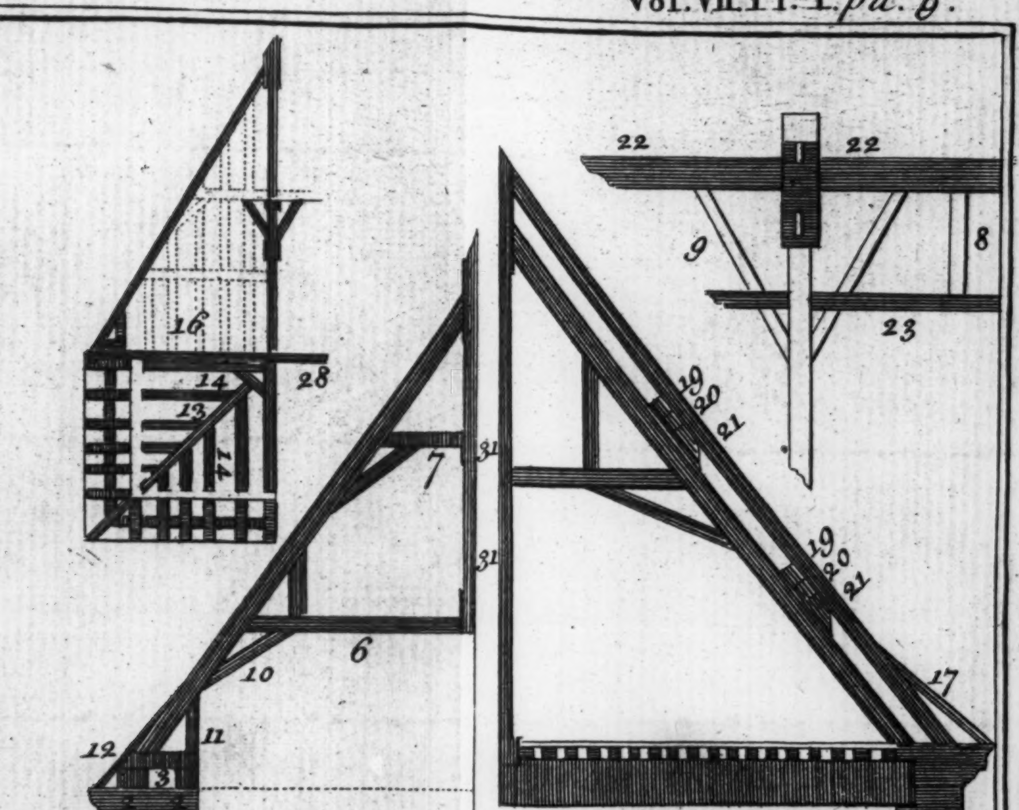


rts of a Timber Building.

and the Timbers, Numb. 16, make up what they call a Truſs.

20. Jaumbs; ſmall upright Squares of Timber reſting on the Square, Numb. 15, towards its joining with the Timbers of Numb. 16.
21. Brackets going acroſs from the Cornet to the Croſs-ſquare, Numb. 15.
22. Rafters, that bear the Laths.
23. The Extremity of the Joyſts that traverſe and ſupport the Rafters.
24. The Brackets; Stays that fix the Joyſts.
25. Pieces of Timber that ſerve to faſten the Brackets.

B. 1. A Thick-Wall.
2. A Plat-form, an empty Place upon the Wall.
3. A croſs Quarter of Timber.
4. Brackets.
5. Joyſts.
6. A croſs Quarter of Timber.
7. A ſmall one of the ſame Kind.
8. The ſame of the Ridge.
9. Bindings.
10. A Bracket.
11. Jaumbs.
12. The Extremity of a Rafter deſigned to turn off Water.
13. The Supports of the Gutter.
14. Rafters meeting at the Top of the Ridge.
15. A Back-rafter.
16. Shortened-rafters.
17. Extremities of Rafters.
18. The angular Pieces of the Roof.
19. Joyſts.
20. Brackets.
21. Pieces that ſerve to faſten the Brackets.
22. The Ridge.
23. The Under-ridge.
24. The Supports of a Garret.
25. Croſs-timbers, which fix the Rafters for Dormer-Windows againſt the Chimney-pipes.
26. The Place at the Roof where the Chimney-pipe goes up.
27. The Paſſage of the Chimney-pipe.

28. The concurring of ſeveral Pieces of Timber towards a ſingle one.
29. A ſquare Joint.
30. The Extremity of the Joint of a Binding.
31. A Mortiſe.
32. A Tenon.
33. A Tenon for a turning-joint.
34. A ſlit Tenon.
35. Croſs-Tenon.
36. The ſhouldring Part of the Tenon.
37. The Tenon cut clean.
38. The Tenon cut ſloping.

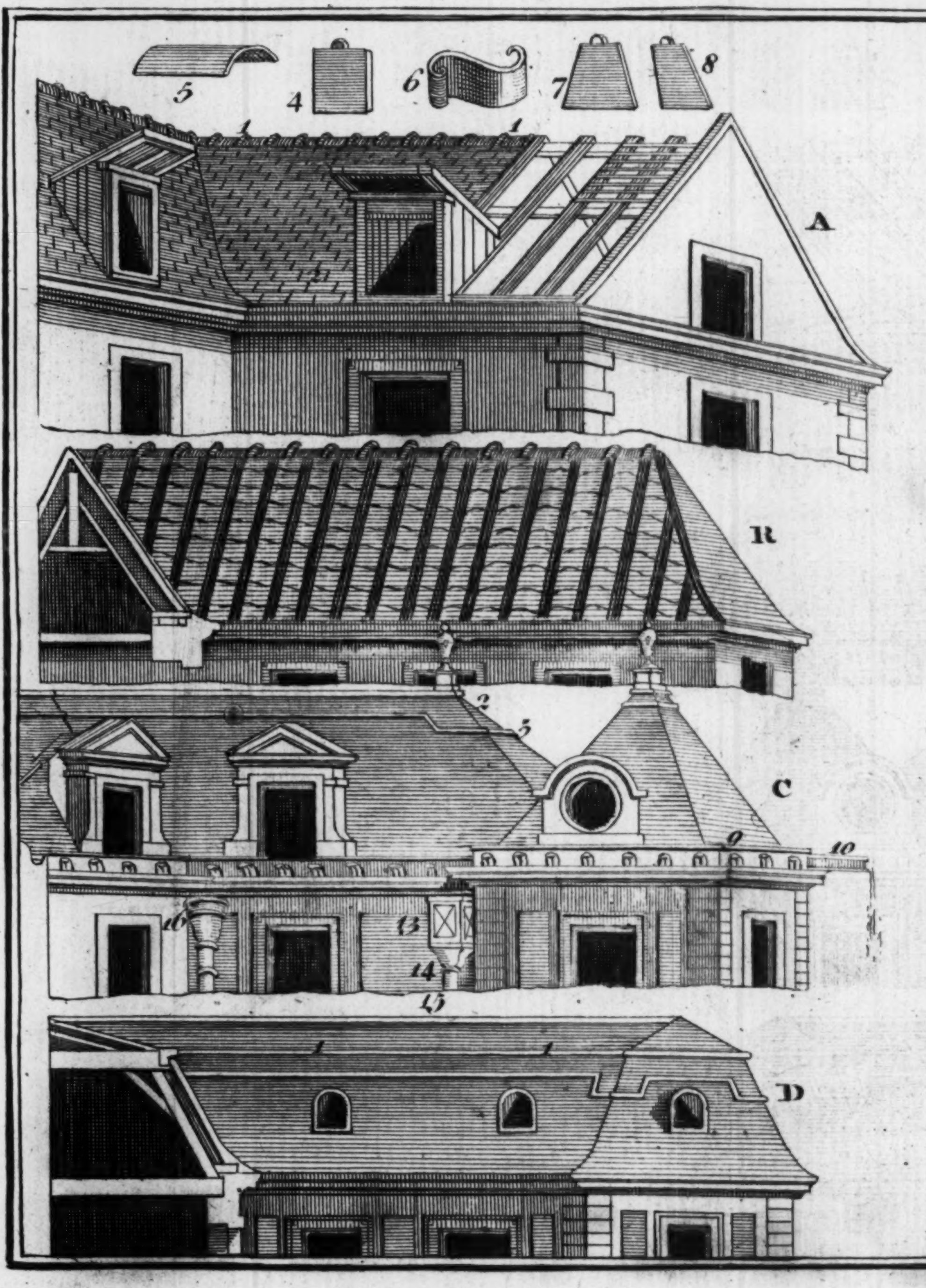
* * *

PLATE II.

A. The Top and Cop of a Houſe, or the Roof garniſhed with Laths for common Tiles.
1. A Ridge-tile to crown the Roof.
2. The viſible Part of a Tile on the Roof.
3. A Dormer Window.
4. Flat Tiles.
5. Round Tiles, ſome of which are laid on the Back, and the others cover the Edges of the former.
6. Tiles in the Form of an S, after the *Flemiſh* Faſhion.
7. Round Tiles.
8. Gutter Tiles, for the Angles.

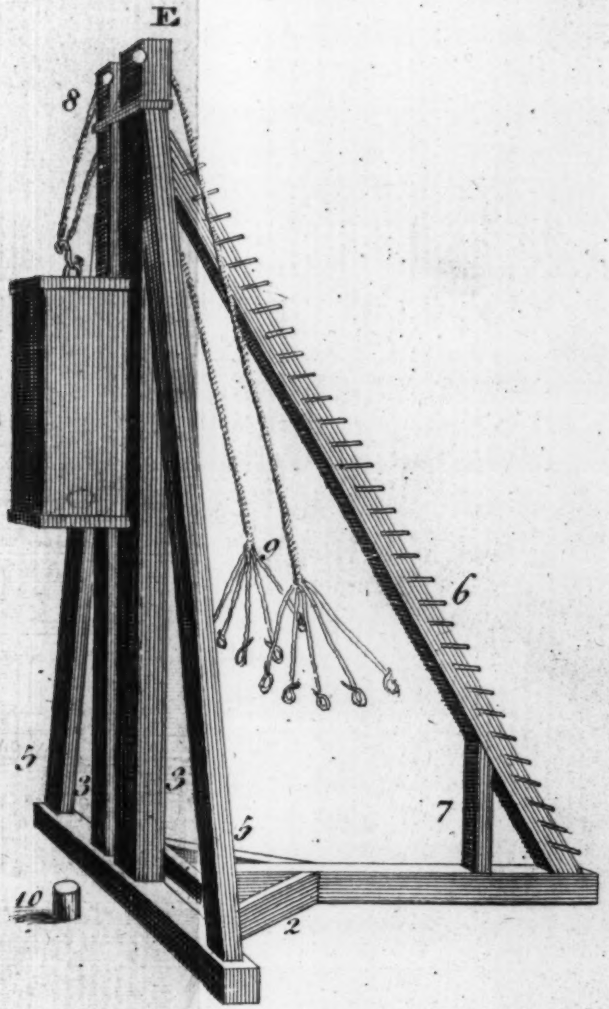
B. A Roof terminated ſloping, and covered with *Flemiſh* Tiles.

C. A Roof covered with Slate in the Manner of a Pavilion.
1. The Ridge.
2. A Peak with a Vaſe at Top of it.
3. A Lead-moulding.
4. Another Moulding.
5. A Piece of Lead to cover the Gutter-tile.
6. A *Flemiſh* Loover.
7. A round Loover.
8. A ſmall Iſſue for Water.
9. A Pipe of Lead, or a Channel that carries Water into a Gutter.
10. A Water Conduit.



Rooſs

Vol VII. Pl. 2. Pa 10.



Engine to drive Piles

BRITISH 16 AU66 MUSEUM

11. Lead-channels to cover the Hooks.
12. The Hooks of the Ridge and Lead-pipes.
13. A ſquare Ciſtern.
14. The Gutter.
15. The Circle of Lead round the Gutter.
16. A Ciſtern in the Form of a Funnel.
D. A Roof cut flat.
  1. A broken Ridge.
E. The Engine to drive Piles into the Ground.
  1. The horizontal Support of the Engine.
  2. The Fork.
  3. The Mounters.
  4. The Rammer. A luggiſh Maſs of hard Wood, or of Iron.
  5. Arms, or Bindings.
  6. A ſloping Mounter, traverſed with Pegs, to do the Office of a Ladder.
  7. A Jaumb.
  8. Pullies.
  9. A Rope divided into Strings.
  10. The Stake or Pile to be driven into the Ground.

Several Men lay hold of all the Strings, and lift up the Rammer, which they let fall again upon the Head of the Pile. They all then begin pulling, at the ſame Signal, and leave off all at once at another.

The Architect.

As Wood is of infinite Help where Stone is wanting, ſo is the Diſcovery of Quarries an ineſtimable Treaſure where-ever Wood is ſcarce, and even where they have it in plenty. Stone is the Solidity as well as the laſting Beauty of Buildings. Though of a rigid and inflexible Nature, it yields to the Efforts of the Chiſel: Nay, it conforms itſelf ſo faithfully to the Deſires and Meaſures of the Geometer, that you would think it as ductile and ſupple as Dough itſelf. Wood and Stone do but wait for Man's Commands: They would be ſo many ſuperfluous Proviſions without him, and the Glory of making a ſymmetrical Body with theſe rough Matters ſo promiſcuouſly diſperſed in a multitude of Places, was reſerved for his Intelligence alone. Our Architect brings them near together, oftentimes without leaving his Study; or, if he now and then goes upon the Spot, he never handles the Twy-bill or rough-hewes any thing with the Chiſel there. Seeing him walk in an eaſy Manner, looking as it were by chance upon a large Work-ſhop full of Artiſts of all Kinds, you would be apt to think this Man perfectly idle, and it is he that does all. It is a ſingle Head that directs an infinite Number of Hands.

The Marker; viz. The Man who marks out the Stones fit to be cut.

The Stone-Sawyer.

The Stone-Cutter.

The Halbardier.

The Labourer.

The Layer.

The Maſon-helper.

The Hod-man.

The Marker, who marks out the Stones that will be of Service, and diſtributes the Patterns of Templets according to which they are to be meaſured and cut; the Sawyer, who divides huge blocks into ſeveral Laminas; the Stone-cutter, who directs his Mallet and Chiſel along the Lines marked out to him; the Halbardier who conveys the heavieſt Maſs into the Stone-yard, with no other Apparatus but a Lever, and a Pair of Rollers; the Labourer, who, by arching his Shoulders againſt thoſe of another Man, hands the Stone ready cut to the Hand-barrow, or carries it with ſix or ſeven other Labourers upon a Drag, quite to the Foot of the Engines ready to hoiſt it up to the Place where it is deſigned to be laid; the Layer, who knows how to put this Stone level upon the yielding Mortar ſtill moiſt; the Maſon helper, who chafes or beats the Mortar or Plaiſter; the Hod-man that carries the Hod; all theſe Workmen, and a great many others that ſhew the greateſt Activity, are either ignorant or totally unmindful of the Effect which the Piece they actually conduct will have. You ſee nothing but Confuſion in their motions. Their ſeveral Works are here and there ſcattered about without any Order or Beauty. The ſeveral Workmen cover the Plain-Work blindfolded as it were, and very much reſemble their Trowel or Mallet. A ſingle Man, who directs ſo many different Operations, is the only Perſon that perceives Judgment and Proportions in them He diſmiſſes all his People at laſt, and what was but an Idea exiſting in his Head is now become a magnificent Reality for common Uſe.

What

The Elogium of an Architect.

What a Man muſt the Architect be, who collects in his Thoughts, and beforehand proportions to the Nature and Situation of the Ground the whole Œconomy of a large Palace, a vaſt Cathedral, a Wet-dock for a Harbour, a Canal of Communication between two Seas or Rivers! He can have nothing little in him, as to his natural and acquired Parts, or even in Point of Sentiments. He muſt have had the *Greeks* and the *Romans* for his Maſters. The elegant Proportions, he ſtill finds in the Remains of their Works, are to him in Lieu of inſtructions. Geometry and Mechanics are his only Tools; and a right Diſcernment of our modern Conveniency his only Guide. Society in its Turn cheriſhes him for having ſo kindly and ſo well ſtudied all its Wants, and Taſtes; nor will it ſuffer his Name to be buried in Oblivion. After a long Revolution of Years and Ages, we ſtill ſay; it is *Bezaleel*, and *Oliab* that directed the Tabernacle of *Iſrael*: It was *Archimedes* that fortified old *Syracuſe*: *Du Cerceau* is the Man that built our *Pontneuf*: We are indebted to *Pagan* and *Vauban* for the Strength and Security of our Fortreſſes: *Riquet* was both the Inventor and Finiſher of the Canal of *Languedoc*.

The forming of a Maſter-Maſon, who undertakes the Execution of any Deſign, does by no means require the ſame Extent of Genius as that of the Architect. But he is a Man of Importance in his Way. If he is of a teachable Diſpoſition, and will leave to others the Care of Diſtributions and Embelliſhments, he may get a name as well as an Eſtate, by always inſiſting upon two Points in his Practice of Maſonry; I mean an unſhaken Solidity, and a thorough Knowledge of both the Ground he builds upon and the Materials the Country will afford him. We eaſily might alledge here many Inſtances, both in great and ſmall, of Miſfortunes occaſioned by a too great Diſregard for theſe two eſſential Precautions: But Men may improve their Methods. We ſhall reſpect them even with their Imperfections; naming them here would be a Satire.

If ever any great Perſon, or Set of well-minded private Men, ſhould attempt the Eſtabliſhment of a new ſcientific Society, my heartieſt Deſire would be to ſee the Reſearches of theſe new Learned fall chiefly upon a Subject very ſimple in Appearance, but of infinite Extent in Reality, and infinitely fruitful, on account of the Multiplicity of its Branches and Uſes: I mean the *Diſcerning and Knowledge of Earths.* This Kind of Study, now languiſhing in the Hands of our Artizans, ſtupidly accuſtomed to an invariable Rout, ought to ingroſs the Thoughts of our moſt attentive, and moſt ingenious Naturaliſts. Such a Society, if it ſhould improve natural Hiſtory, Chemiſtry, our ſeveral Dyes, the Manufactures of baked Earths, Maſonry, and the Arts of Huſbandry and Gardening, would deſerve the Applauſe of the whole human Species.

A Subject well worthy to buſy a whole Academy.

But, what need we wiſh for new Aſſociates? Such of our Gentlemen in the Country, who are generouſly deſirous of doing Service to Mankind, and thoſe of our Country-Clergy, whoſe Inquiſitiveneſs and Diſcernment are not blunted by the want of Company, being always at Hand to ſee the Works of Nature with their own Eyes, or to aſk Queſtions of thoſe whoſe Profeſſion it is to cultivate, dig and turn up all Sorts of Ground; ought to commit to Paper every new Thing they obſerve or learn. Making themſelves ſure of every particular Fact by accurate Trials, would be an inexhauſtible Source of entertaining Occupations to them; and they would enrich the Public with their Diſcoveries by communicating them to the Academy of Sciences. That Society may be looked upon as the public Depoſitory of all Diſcoveries, or the Regiſtry of all uſeful Sciences and Branches of Knowledge.

Maſonry goes, as well as her inſeparable Siſter Carpentry, upon very ſimple Principles and Maxims in her Operations, and, like her, uſes Tools whoſe Service is alſo of the utmoſt Simplicity. Caſt your Eyes on the Figures of theſe Inſtruments in the Principles of *Felibien*; whilſt we inquire here into the Origin of the Tenacity of the Materials ſhe employs, and into the Manner of working them.

The Origin of Tenacity.

The Effects of plain Nature were ſufficient at firſt to direct with ſome Succeſs the Operations of Workmen. Experimental Phyſics improved them from Age to Age with new Remarks. Naturaliſts found out very ſoon, that the Inſinuation of Liquids between the Maſſes of ſolid Bodies conveyed thither an Action and an Effort capable of diſuniting them in Proportion to the Quantity or Activity of theſe Liquids. They obſerved, on the contrary, that, in what Manner ſoever the Thing be executed in the Arcanum of Nature, who ſeems bent upon concealing it from us, the Coheſion of the ſmall or large Maſſes of Bodies was due to the Draining of Liquids. Water is of itſelf no Liquid : It becomes ſuch only by the Inſinuation of Air into it, and of that true general Principle of Liquors, Fire. The Diſſipation of the latter brings Water back to its natural Condenſation. It is the ſame Thing with Blood, Oils, Salts, and a great many other Bodies, which thicken in Proportion to the vaniſhing of the Fire, and with which Fire acts very differently, as the ſame Hand ſtrikes very different Blows with a Switch, a Hammer, and a Club. It is in Conſequence of this Remark, that they make a great Fire to raiſe all the Particles of Metal, and put it in a State of Fuſion. From a Conſequence of the ſame experimental Principle, large Fires have been uſed towards putting all the Particles of the Lime-Stone and Parget in Motion, which facilitates their immediate Pulverization, and makes them comply with our Deſires. When the Water, which keeps thoſe Particles in a State of Diſunion, ſhall be diſſipated, they will reſume their former Tenacity. A ſimple Vapour, that penetrates a Rope, ſwells and ſhortens it by increaſing its Breadth, even ſo far as to lift the Weight hanging on it. Dampneſs is a true liquid, which ſeparates more or leſs the Particles of the Body it has penetrated. This is perceived from the Degree of Thickneſs which the Tortoiſe-ſhell-lid never fails to acquire by being dipped into Water, or from the Swelling of a Door that refuſes to ſhut after rainy Weather. But our Conviction of this Fact will be far greater, if after having rough-hewed a large Piece of Mill-ſtone in Form of a Cylinder and circularly cut in it as many parallel Sections as the whole Piece will afford Mill-ſtones, you drive along each circular Notch a Multitude of Pegs, or Wedges of the dryeſt Wood. This done, you need but wet with Spunges the outward Extremities of thoſe Wedges, to dilate all the Fibres of them, and procure an Action there that will complete the Cutting of the Mill-ſtones quite to the Heart of the Kernel which had not been touched, and intirely ſplit and ſeparate every ſuperior from each inferior Section.

Stagnant Waters, or long Overflowings, are for this very Reaſon the more to be dreaded for Buildings. If the Edifice is wholly framed of Timber; the moſt porous Kinds of Wood being ſwelled by Moiſture more than any other, they, in Length of Time, diſcompoſe and diſlocate it by the overpowering Superiority of their Effects. Buildings, conſiſting of good Maſonry, are not in the ſame Danger; but Water can never looſen the Maſonry of the Foundations, nor eſpecially carry any Particles of it away in its retiring, without weighing down the Matters of it that draw nearer to each other than they were before, and without communicating the ſame Diſlocation to the Work above Ground.

The Fluids like Air, Water, and Fire, which cauſe ſo much Diſorder in Buildings, eſpecially by the Diſſipation of a great many Parts of the uniting Matters, on the contrary, cauſe a greater Rigidity end Tenacity there, when they diſſipate without carrying any Thing away with them. The fluid Matters cannot vaniſh intirely from between two neighbouring Surfaces without cauſing them to touch one another immediately in a Multitude of Points, and to unite as cloſely as if they were but one and the ſame Body.

The Air drawn from between a couple of ſmooth Pieces of Marble by the Suction of the Air-Pump, exerts its Spring no longer there, and ceaſes to work for their Diſunion. The univerſal Preſſure (let the Cauſe of it be what it will) acts then upon theſe two Marbles, without being reſiſted by any intermediate Action, or Fluid, and it compreſſes them ſo ſtrongly one againſt the other, that very great Efforts can hardly pull them aſunder. The ſame Coheſion, or at leaſt an Union begun, is perceived between a Couple of ſmooth Marbles, or Slates, let ſlide one upon the other, ſo as to admit hardly any Air betwixt them. The Leaf of Pewter, or the Foil upon which the Glaſs of a Mirror has ſlid horizontally, ſticks to the Glaſs ſo ſtrongly as it does, only on Account of the univerſal Preſſure which never fails to declare itſelf by the ſtrict Union of the ſmooth Surfaces between which no Air or Water is admitted. In this Caſe, the Quick-ſilver, with which the Foil is bathed, has effectually ſtopt all Paſſage to the Air, by running on all Sides towards the Edges of the Glaſs that ſlide horizontally on the Pewter.

The Action of Fluids, ſo detrimental to us, in ſome Caſes, is of infinite Help, when we but obſerve the Progreſs of it, and have the neceſſary Skill to make it conduce to our Benefit. Dry Weather, or a certain Degree of Fire, drives away and diſſipates Water without any Violence. The latter carries away with it, in the Evaporation, a great Quantity of Air with which it is moſt commonly replete, and which it contains in the ſame Manner as a Maſs of liquid Glaſs contains and ſurrounds dilated Air which the Glaſs-maker blows into it through his Pipe. The Water vaniſhes in Proportion to the Quantity of Fire which penetrates it, and which dilates the Air, which each Bubble of Water may have abſorbed; ſo that this Air, being more dilated than the external Air, it neceſſarily reſults from thence, that the Bubbles of Air and Water ſpring out and then diſperſe themſelves according to the Degree of the Heat that puſhes them forward. If they contain leſs Matter than is contained in the Moleculæ of the Air of which they fill up the Room, they muſt needs be buoyed up, riſe, and ſtop at laſt in that Region of the Atmoſphere where they are in an Equilbrium with the ambient Bodies. The perfect draining away of all Moiſture betwixt two Surfaces leaves Room for a freer Compreſſion; and very likely it is in this that the greater or leſs Hardneſs and Union of Surfaces doth conſiſt.

Such are the Agents that work ſecretly and powerfully for us. This Operation is concealed. The Philoſophers have a Suſpicion of it, though they cannot comprehend its firſt Cauſe. Workmen ſee the Effects of it, which are ſufficient Guides to them. Pumping out the Air which is between a Couple of Stones, or among a Multitude of Grains of Sand, whereby more ſtrictly to unite their Surfaces under the Effort of Gravitation, which is always retarded by the Obſtacle of the Air diſperſed in the Interſtices, is altogether impoſſible: But we have here our Recourſe to an Expedient. We throw between the Stones a Lay of Mortar that has a twofold Effect; ſince it facilitates the exact Poſition of the Stone intended to be laid, by yielding every Way to its Weight, and then keeps between the Stones an innumerable Multitude of ſmall Surfaces immediately applied to each other, by the vaniſhing of the Moiſture of the Cement, which Drought or Fire drives out of it. The exceſſive Tenuity of theſe Particles cauſes no Kind of perceiveable Sinking in the Matters thus conjoined.

It is another Matter of Fact, now very well known from Experience, that Water, in Company with Air, creeps into ſmall Apertures, which the Air cannot enter into alone; and that they make uſe of Water in order to expel the Air, that goes out along with it; but that the perfect drying away of the Water occaſions afterwards ſo exact a Contact of the minuteſt Surfaces, that from that Time no Air, or Water, can any more inſinuate betwixt them.

What Drought produces between the Maſſes of Stone and the Cement, it likewiſe brings to paſs between the ſandy and earthy Particles of the Cement itſelf. The latter is by its Nature a firſt Maſonry conſiſting of hard and inflexible Particles which we call Sand, and of other ſupple and pliant Particles which we call Slime or true Earth. It is a known Fact, that a ſmall Globe touches the neighbouring Bodies in a greater Number of Parts than a very large one, on Account of the vaſt Diſproportion of the Parts contained in the latter. Therefore the more the Slime which enters into the Mortar is attenuated and fine, the more Surfaces it offers to the Sand to which it is joined. It gives ſo much a greater Hold to the Preſſure of Gravity, that will exert itſelf when Fire ſhall cauſe the Air and Moiſture that ſtood between one Surface and another to vaniſh. The Lime-ſtone, which is united together with the Sand, or with the half-vitrified Maſſes of Tiles and Bricks, conſiſts chiefly of a very fine Slime fit to fill up the Interſtices of the Sand, ſo as that the Water being abſorbed between the ſmall Surfaces of the Slime it may be immediately united into one Maſs with the Sands and harden the whole together with the neighbouring Stones, by the Evaporation of the Moiſture and Air from between an infinite Number of Points, which remain thus conglutinated, and in Time become almoſt inſeparable.

Some conclude from thence, that inſtead of binding the Sands by the Intermixture of the Slime, and Stones, or Bricks, by a Lay of Mortar, one might build without Cement, by poliſhing the Stones very well after having cut them perfectly true, and by making them ſlide horizontally one upon another. But, the Execution of this Method would perhaps be more difficult and leſs certain than that commonly uſed. Building philoſophically is one Thing, and building ſolidly is another, They nevertheleſs are of Opinion that the Stones of ſome antient Edifices have been laid immediately one upon another (perhaps after having been rubbed a great while one againſt another) and without the leaſt Appearance of Cement between them. Such is the Gate of *Rheims* called *Porte Baſee*; which is one of the ſix Arches which ſeem to have been built, either in order to honour the Emperor *Probus* by a Monument of their Gratitude for his planting at that Time the Vine in *Gaul*, or to honour the Station which *Carus*, or *Julian*, made in the *Belgic Gaul*, The Antients had a great many fine and exquiſite Methods of Maſonry which we find again in *Virtruvius*, and in *Bergier*'s great Roads of the Empire. The Remains of them are ſtill at *Rome*, *Verona*, *Niſmes*, and in our High roads. There is much Benefit to be reaped from the Study of the Maſonry of the *Thermes* of *Paris*, many conſiderable Parts of which are ſtill extant and of an eaſy Acceſs betwixt the *Hotel de Clugny* and the *Ruë de la Harpe*.

The ſeveral kinds of Maſonry.

We have at preſent but five Kinds of Maſonry in Uſe among us; *viz.* *Bound Maſonry*, *Brick-Work-Maſonry*, that called *de Moellon*, that where the Courſes are unequal,

equal, and that called Rough-walling. The latter is the leaſt of all, and is a Mixture of ſmall Stones and Pebbles ſwimming in Water. The Maſonry, which has its Courſes unequal, is made with ruſticated Moellon, that is, with Stones of ſome Bigneſs, but rough, and ranged ſo as not to offer to the Eye a ſquare regular Surface without. The Maſonry of *Moellon* is that where the Stones, though rough, are nevertheleſs ſomewhat poliſhed, well ſquared, and pitted into a Grain, that they may the better admit and retain in the ſmall Cavities the Parget or Cement with which the Whole ſhall afterwards be plaiſtered over. Brick-work is that made of uniform Pieces of baked Earth, laid in the binding Way, and after the *Greek* Faſhion. The Binding is the joining of the Matters with Plaiſter, or with Mortar made of Sand and Lime. The *Greek* Maſonry conſiſts in laying the Middle of a Brick over the Joint that ſeparates two others. Laſtly, Bound Maſonry, the beſt of all Maſon's Works, is that made with ſquare Pieces of Stone and Stones laid acroſs, and where the Joint of two Stones is perpendicular to the Middle of the inferior and the ſuperior Stone. Of two Stones, which enter into the Series of the ſame Courſe of fine Maſonry, one has a greater Face or Parement, that is, a greater Length with out-ſide, and is called Square; the other has a leſſer Parement, which means, that it has its longeſt Dimenſion in the Solidity of the Wall, and offers to the Eye its Ends, *viz.* its narroweſt Side. 'Tis what they call Croſs-ſtone. The Square and the Croſs-ſtone follow one another alternately, and great Care is taken to make the two Extremeties of them reſt full upon the Middle of the inferior Stone. All theſe Kinds of Maſonry, as well as the ſeveral Ways of Paving, Tiling, Wainſcoting, Boarding, and Inlaying, require Prices which vary according to the Matters, Meaſures, and Length of the Work.

When we would follow *Julius Cæſar* in *Germany*, or attend *Pliny* the Younger to his fine Houſes of *Tuſcany* and *Laurentine*; we put ourſelves in the Way of underſtanding the Structure of the Bridge thrown over the *Rhine*, or the Œconomy of a *Roman* Edifice, by taking the true Notions of antient Architecture either from *Vitruvius*, or in *Perrault*'s Commentaries, or *Felibien*'s Explanations (1): And this kind of Work opens a Door to Readings equally amuſing and inſtructive. But why do we not take the ſame Care and Trouble about Things which concern us infinitely more? We daily make Alterations and Reforms in our Houſes, without ſo much as knowing what a Hundred of Timber (2), or a Fathom of Maſonry (3) is, or will coſt. Whence we are expoſed to the Misfortune of being deceived, or liable to exclaim againſt the Amount of an Artiſan's Bill, without knowing what we are about: Our loud injudicious Expoſtulations raiſe his Laughter, and diſparage us in his Eyes. He, truly, ought to be under our Direction, and we are led by him at Pleaſure.

Paving.

It is in vain private men procure fine Habitations to themſelves, if the Out-ſides of them are dirty, or ſtagnant Waters, and the Softneſs of the Ground deprive him of the free Acceſs of Markets, and the Facility of Tranſportations. It will then be wiſe for him to make his Buildings of a moderate Extent, not ſpare any Expence to render the Out-ſides and Avenues of them free and cleanly. They muſt be acceſſible, and fit to live in.

If a private Man buys a Houſe ready built, his firſt Care is to make ſure that there is no Ground about higher than the Ground-floor, though it were only half a Foot; nay, but one ſingle Inch He knows, or poſſibly may know, that Moiſture is a true Fluid, and that every Fluid always ſpreads itſelf level all around; whence it neceſſarily happens that the Moiſture in that Inch of Ground, by which his Yard or Garden is higher than the Floor of the Hall, muſt, in extending, ſpread through the Wall, and not only alter the Inlaid floor, which it pervades ſide-ways, but alſo the Air and Furniture of the Houſe as well as the Health of the Maſter. What if there be any Ground ſeveral Feet higher than

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1. See Pliny's Houſes by Serlio and Felibien.

2. A hundred Pieces of Timber 12 Feet long and ſix Inches thick or the Equivalent.

3. It is the Product of ſix Feet multiplied by ſix; that is, ſix and thirty ſquare Feet of Maſonry. The Price varies according to the Thickneſs and Kind of both the Materials and the Work.

than the loweſt Part of the Houſe? What if there be in its Neighbourhood any Terraſs, or Hill, not ſufficiently diſtant from it? Beſides what runs from Declivities down into the lower Parts of the Houſe; the Moiſture iſſuing from higher Grounds ſoon ſtagnates in the Air between the Mountain and the Building. It makes itſelf level and rots every Thing there when it does not find very ſpacious Lands round about, to diſperſe and freely evaporate in the Plain.

I inſiſt chiefly upon a Houſe being ſituated in a fine Air, and not only by itſelf, and conſiderably diſtant from all Terraſſes and Declivities; but I would have it above all ſeated ſome Feet if poſſible, or at leaſt a few Inches higher than the Ground it ſtands on. This laſt Caution, ſo much neglected in the Houſes of the common People, eſpecially in the Country, would be a fit Subject for ſome wiſe Regulation of the civil Judge. The Overlooking of it is fatal to great Multitudes by the collecting of cold Humours, and it impairs the Conſtitution of thoſe it does not kill in their Infancy. If they continue to live notwithſtanding theſe Dangers, it is becauſe their Health is maintained by the Activity and Briſkneſs of the open Air, and is one of the good Effects of conſtant Labour.

The Neceſſity of paving the high Roads, or of keeping them conſtantly practicable.

Next to the Care of rendering our Houſes habitable by keeping them quite above Ground, nothing is more neceſſary than to render them acceſſible to all Proviſions, and, by Means of ever practicable Roads, to facilitate the Communication to all Places of Correſpondence. A Maſter cannot be ſaid to be well lodged when his Domeſtics are not ſo, or when whole Heaps of Mire ſeparate him from the Markets he cannot do without. But our trueſt Domeſtics as well as our moſt neceſſary Market-places are not what we think of; and it is on Account of our Negligence that the Services of both cannot reach our Habitations with Eaſe.

Our true Market-place.

Our fineſt Market places in *France* are *Port l'Orient*, where is our Staple for all Grocery-Wares, and *India* Commodities; *Nantes* and *Roüen*, where our *American* Colonies ſend the greateſt Part of theirs; *Marſeilles*, which fetches us the Drugs of the *Levant*, and ſo many other Places whence we have our Stuffs, Wines, and other Goods for common Conſumption.

Our beſt Domeſtics.

Thoſe who bring them to us from all Parts of the Kingdom, or who go and buy them for us in the neighbouring Provinces and even in foreign Countries, are our true Domeſtics. Our whole Kingdom is then properly ſpeaking but one Town, but one Abode, all the Inhabitants of which ought to help one another, and all the Cantons of which ought to be eaſy to come at. The Bookſellers of the *Rüe Saint Jacques*, and the Grocers and Confectioners of the *Rüe des Lombards*, receive greater Helps from ſeveral remote Towns than they do from certain Parts of their own City. They therefore concern themſelves more for the good Condition of the Roads that bring them the Paper of *Auvergne* and *Angoulême*, or the Soap of *Marſeilles*, than the Beauty of the Pavement that carries them to the *Eſtrapade*, or the *Marais* (1); and what concerns them is of equal Moment to ourſelves. All the parts of a State correſpond with each other; and it is the Facility of conſiderable Communications that conſtitutes the true Happineſs of our Abode.

If it cannot be paved (2) from one End to the other after the Manner of the *Romans*; let it be paved ſlightly at leaſt. If paving our Roads, even after the modern Faſhion only, is too great an Undertaking; at leaſt let the dangerous Parts of them be raiſed, levelled, and from Time to Time rendered firm by a few Lays of Stones and Gravel. This would be an unexhauſtible Source of Work and Profit for Families deſtitute of Bread. Now our Roads cannot be thus univerſally kept in Repair, or the People univerſally imployed without giving greater Life to Commerce, and rendering our Habitations more flouriſhing. The Beauty of the Pavements, the Walks of public Buildings of the Towns we are ſettled in is but a ſecondary Happineſs. Our greateſt Bleſſing depends chiefly on the Activity of the whole Nation which inhabits our common Country, and on the perpetual keeping in repair of the Roads that put all the Inhabitants within the Reach of being of Service to each other.

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(1) Two different Quarters in Paris.

(2) See above, Vol. III. Dialog. 3. upon Quarries.

You know well enough the Figure and Uſe of that Shovel which ſerves to move the Ground; of the Twy-bill which ſerves to pluck up Pavements, and of the Hammer uſed to cleave and break Stones, to dig the Earth and pave the Way; you know the Agility of that Rammer * which is made to dance ſucceſſively upon every Stone. All theſe Tools are to be met with every where; and we much leſs want to be taught how to pave, than we need to be convinced of the Neceſſity of employing our free Stock of Money, and chiefly our Alms, in keeping in Repair, by Means of the Poor, ſuch paved Places as ſtand in need of it; or in repairing, from Time to Time, the greateſt Diſorders of unpaved Roads. The moſt Chriſtian Prudence, and the moſt perfect Charity does not conſiſt in making Endowments, beſtowing Legacies, or giving Monies for the ſuſtaining of the Poor, but in doing all theſe Things to the End that there may be no Poor at all.

The Structure of our Habitations, that important Part of our Wants and our wiſeſt Delights, may be conſiderably aſſiſted by the ſeveral Parts of the uſual Phyſics; and by that habitual comparative Diſcernment which accuſtoms us, both in great and ſmall, to diſtinguiſh true and real Beauties from Appearances void of Judgement and Solidity.

But thoſe very Men, who have not learned the Princies of any Art, or are not Maſters of any Numbers of practical Sciences, are not deſtitute of all Help. The Experience of all paſt Ages, the Knowledge of the Learned, the wholſome Advices of judicious Artiſts, are as it were reunited and immortalized in the Regulations of our modern Polity. All is fixt as to what concerns the Public, without any farther Care on our Part. The Cleanlineſs, Freedom, and proper Width of our Streets; the Suppreſſing of Projections in our Building,

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1 The original Word is Demoiſelle, that is, Lady: The Author alluding to the Double-meaning of the Word, which ſignifies alſo a Paviour's Beetle or Rammer.

of infected Ceſs pools, and all hurtful Services; the proper Regulations for ſetting Houſes in a Row; the Choice and Mixture of the Materials; ſkilful Workmen; Solidity; all in ſhort has been provided for and ſecured. Every private Man has his Houſe better built than if the Management of it had been left to his own Prudence. His Liberty has been abridged only as much as was neceſſary to make him eaſy without hindering others from being ſo. We are unable to annoy any Body and the Dangers impending over us are puniſhed like true Evils.

The FURNITURE.

DIALOGUE XVI.

THE Carpenters, Maſons, Tilers, and Paviors are now retiring. The main Houſe is completed by this Time, and needs only be dried and furniſhed to be habitable. Other People, no leſs induſtrious than thoſe who have left the Place, are now come to offer their Services to you in Emulation. Every one is deſirous and proud to have Pieces of their Workmanſhip admitted there. The Upholſterer, the Smith, the Joiner, the Toy-man, the Turner, the Glaſs-maker and Glaſier, the Plummer, the Founder, the Silver-ſmith, the Cutler, the Tin-man, the Braſier, the Earthen-ware man, and a great many others, either come to aſk us what we deſire, or bring us Utenſils to chuſe. We are at a Loſs whom we ſhall hear firſt.

We never make our Purchaſes better than when we have informed ourſelves of the beſt Materials employed in each Profeſſion, of the moſt judicious Taſte in the working of them, and of the Price both of the Matter and Workmanſhip. Theſe Inſtructions are not the Reſult of a few Queſtions aſked in a curſory Manner. They require a little Practice; nor can they ever be ſurer of a ſpeedy Succeſs, than by the Compariſon of the Works and Prices. This is a Study never attended with Fatigue, or ſubject to any Diſguſt. By what Whimſey do we ſo frequently refuſe theſe Inſtructions, which we know are both entertaining and infinitely ſerviceable, to hunt after pretended Sciences that give us nothing but Trouble: But, we unjuſtly complain here againſt the Knowledge which young People ſeek for, or the Trouble they take; they are docile and deſirous of knowing whatever we boaſt of.

The right Method for quickly acquiring the Particulars of this Knowledge, concerning which we ought never to ſtand in Need of aſking Advice, conſiſts in ſeeing ourſelves all Sorts of Works manufactured, but chiefly in hearing the beſt Workmen ſpeak of their reſpective Arts. They are excellent Maſters, and their Anſwers the ſureſt Inſtructions. You may begin by conſulting a few Books upon Arts and Profeſſions eſpecially when they are attended with good Cuts. Then leave your Books and paſs into the ſeveral Work-ſhops, in order to ſee the Realities of your Figures. You will experience there, I hope, the ſame Pleaſure we feel in ſeeing a Town, or a Sea-port of which we have read Deſcriptions. There is a real Satisfaction, in thoſe Caſes, to be beforehand with one's Guides, by telling them truly the Names, Uſes and reſpective Properties of the Things one has ſeen only in Picture. The Workman, who ſhall ſee you fond of his Art, will, in his Turn, take a Delight in inſtructing you. An eager Diſciple begins by winning the Heart of his Maſter. This Man, without interrupting his Work, will infallibly endeavour to make ſome uſe of every one of his Tools in your Preſence, and as long as you are with him he will be wholly intent upon indulging your Curioſity.

There is no Profeſſion but what I would follow Step by Step, nor any ſkilful Artiſt that I would not liſten to, not only to procure to myſelf uſeful Inſtructions concerning his Art, which makes a part of my Wants, but alſo to cauſe him to give ſome new Leſſons of Phyſics without having himſelf any ſuch Intention. We have already

One Part of ſound Phyſics is in the Hands of Artiſts and Workmen.

obſerved, that Experiments, which are almoſt the only Source of true Kowledge, were in the Hands of Workmen. But there is ſtill more than that; Artiſans, even the rougheſt, have often a natural Taſte of Mechanics that endears them to us: and they commonly enough perceive, here and there, in their Way towards their peculiar Object, a great many Things which had been overlooked, or were intirely unknown.

A ſingular inſtance of a Potter.

Two hundred years ago a Potter, as he was examining the Clay, and other Matters he wanted for his Handy-work, diſcovered a Number of very curious Things, which a great many among the learned have afterwards very loudly boaſted of, without thinking it proper to name him (a). It was Goodman *Bernard Paliſſy* of *Xaintes*, a plain Potter, who, notwithſtanding his being totally deſtitute of Letters and Taſte, and his having even ſometimes very odd Notions, has, from the bare Obſtinacy of his Reſearches, given us Inlights into the enormous Miſtakes which were at that time and are ſtill committed in the Management of the ſeveral Compoſts deſigned for the fertilizing of Lands; upon the Excellence and Uſe of Marls which were almoſt entirely unknown in his Time; upon the Emptineſs of the Virtues then attributed to precious Stones; upon the free Origin of Fountains, and ſome other Parts of the moſt curious Phyſics. We muſt not make it a Crime, his returning ſometimes to generative Powers, which either have no Exiſtence, or act quite otherwiſe than he imagines. Nor muſt we think it ſtrange, that after having found out that foſſil ſhells are the Cells of Animals who lived in them, he accounts for it by recurring to imaginary Ponds, which he contrives as well as he can at the Top of the higheſt Mountains, although they neither could be found ſo univerſally, nor feed or harbour any marine Animals. But, we hardly conceive how he could go ſo far with ſo little Help, and at a Time when that Kind of Study was ſo utterly neglected. He himſelf helps us out of our Amazement, by telling us, that People uſed to laugh at him for preſuming to talk of Phyſics without having read *Pliny* and *Ariſtotle*; but that his uſual Anſwer to their Banters was, *that he had read Nature.*

(a) See Le moyen de devenir riche, by Bernard Plaiſſy.

There are no Workmen with any Share of Ingenuity, if we put but our Queſtions home to them, that will not lead to ſome Truths hitherto unknown, or to the clearing of thoſe, with Regard to which we were as yet in the Dark. They are our beſt Books, next to the Book of Nature.

There are other Artiſts who will not perhaps teach us any new Truths; but whoſe Dexterity will daily produce Works of raviſhing Beauty. But then we are not ſo unjuſt as to overlook, in the Croud, Men who diſtinguiſh themſelves by extraordinary Talents. With what Tokens of Eſteem and Conſideration a Silverſmith, like Mr. *Germain*, is received at Court and in Town! We ſhould admire his Draughts, were they only executed in ſo pliant a matter as Wax or Clay.

There are aſſiduous People, who take a Pride in finiſhing whatever they do, and will beſtow eight Days together on the poliſhing of a Piece of Steel. A Merit of this Kind cannot be too much eſteemed, but it is of an eaſy Acquiſition. The Workmen of ſome other Countries are ever intent upon gaining the Eſteem of the Public by agreable Novelties. Seeing them handle Tortoiſeſhells, Wood, Braſs, and Iron, you would be apt to think they have no other Science but that of the Motions of their Fingers and Tools. But the Emulation, which fires them, ſoon unfolds a Ground of good Taſte and Ingenuity, from whence Conveniency, Gracefulneſs, Grandeur and true Sublimity will ſucceſſively ſpring. Deſcending from theſe honourable Profeſſions down to the humbleſt, and viewing them by Turns, as Occaſion offers, we ſhall find that they have equally ſtudied and brought to Perfection what could be either neceſſary or agreeable to us in a Room, Parlour, or Kitchen, and in every Part of our Habitation as well as in the ſeveral Circumſtances of Life.

A true Benefit of the Knowledge of Arts and Trades.

One of the beſt Reſults of the Diſcernment we acquire, in Point of Works and Workmen, is that we are ſure of the beſt Taſte and a laſting Service generally in whatever we beſpeak for ourſelves, or adviſe others to have. Workmen know that Neatneſs and Genteelneſs are required in every thing. The Love of Lucre very often makes them overlook the Goodneſs of the Service, on Account of the Facility, with which they quickly give to ſmall Works a Gloſs or Poliſh which impoſes on the Buyers. Whence it happens that our Goods reſemble (but too much indeed) thoſe glittering Bawbles that compoſe the houſhould Furniture of a Doll. They are laviſhly guilt, varniſhed or painted; but they commonly have no other Merit. I am by the Fire ſide and happen to want the Bellows to make a briſk Blaze. I ſee one which pleaſes my Eye at firſt Sight by the lively red Colour of its Folds, by the inlaid Work which ſets off one of its Boards, and the ſeeming Gold-lace that borders it round. Altho' the lace, Braſs-nails, and Tortoiſe-ſhell are nothing to the Purpoſe; I begin however by thinking that theſe Bellows were made purpoſely to blow a Fire. I then lay my Hand on it: But the Noſe falls off the Minute I touch it. 'Tis in vain I put it in its place again. The Wind comes in and goes out every Way, and the new-bought Bellows are hardly dry by feeling the Fire, but they are perfectly aſthmatical. It is much the ſame with all the Things we buy without Knowledge. We are fond of gilt Tools, and Workmen accordingly give rough-hewed Incruſtations, that tarniſh in a few Days, or peel off with the ſlighteſt bruſhing. We will have veneered Cheſts of Draws, and Tables of inlaid Work: But by-and-by each Piece will ſtart, and the Whole ſoon ſcales away. We ſeem to buy Goods only to look at and make a Shew of them. If we have not followed the Work of Artizans ſo as to be intitled to direct them in the doing of what we beſpeak, or of judging right of the Things they expoſe to Sale; we ſhall prove at laſt to have carried our Money to a Set of downright Toy-men. Of Artizans, which they now are, they will infallibly become Artiſts, whenever

ever we ſhall know the Price and intrinſic Merit of Things.

As Neceſſity obliges us every-where to find out and know the Joiner, the Founder, the Glazier, the Turner, the Iron-monger, and the Generality of the Trades that ſupply us commonly with Furniture, I was contented, Sir, with procuring you a Draught of the two Inſtruments which ſerve to prepare for us the moſt precious of all Matters, and the vileſt of Metals; I mean, the Diamond-cutter's Wheel, or Mill, and the modern Inſtrument with which Lead is laminated; both Inventions being very curious, and the Province you reſide in too remote to allow you to ſee any of them.

PLATE III.

The Figure and Deſcription of the Turn *of the* Diamond-Cutter.

a The Pincers.

b The Screw of the Pincers.

c The Shell that carries the Maſtick and the Diamond.

d The Maſtick that faſtens the Diamond at the End of the Shell.

e The Diamond preſented to the Iron-wheel to be cut facet-wiſe.

f The Iron-wheel turning out its Pivot.

g Iron-pegs to fix and keep the Pincers ſteady.

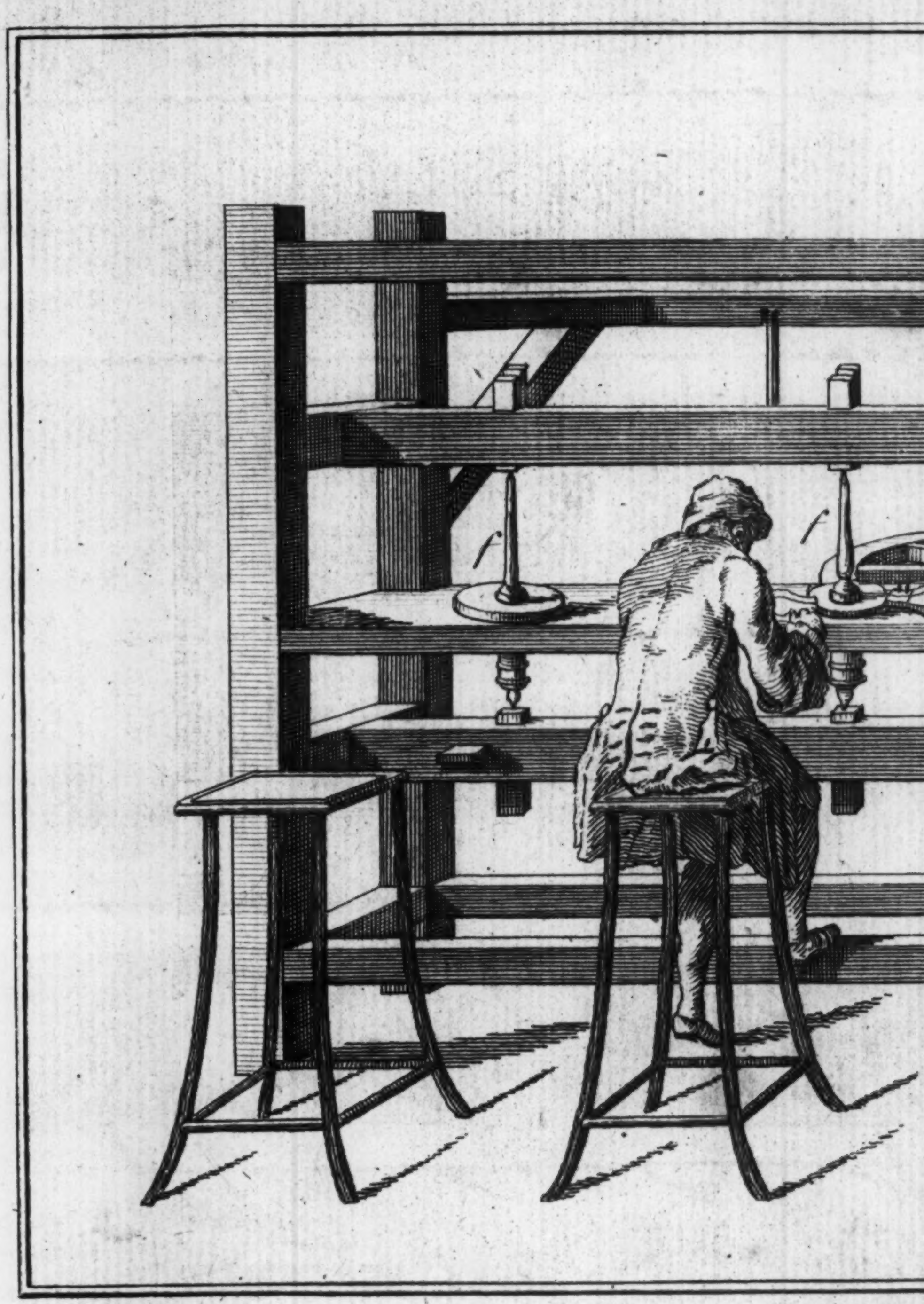
h Small Pigs of Lead of different Weights, wherewith the Pincers are loaded at Pleaſure to keep them ſteady.

i A Wooden-wheel.

k The Axe of the Wheel. It is bended and makes an Elbow under the Wheel, to receive the Impulſion of a Bar that does the Office of a Turning-handle.

l The Sole, or ſquare Piece of Steel, wherein the Pivot of the Tree or Axis moves.

m The Turning-handle that ſets the Wheel a-going, by



Diamond Cutters W

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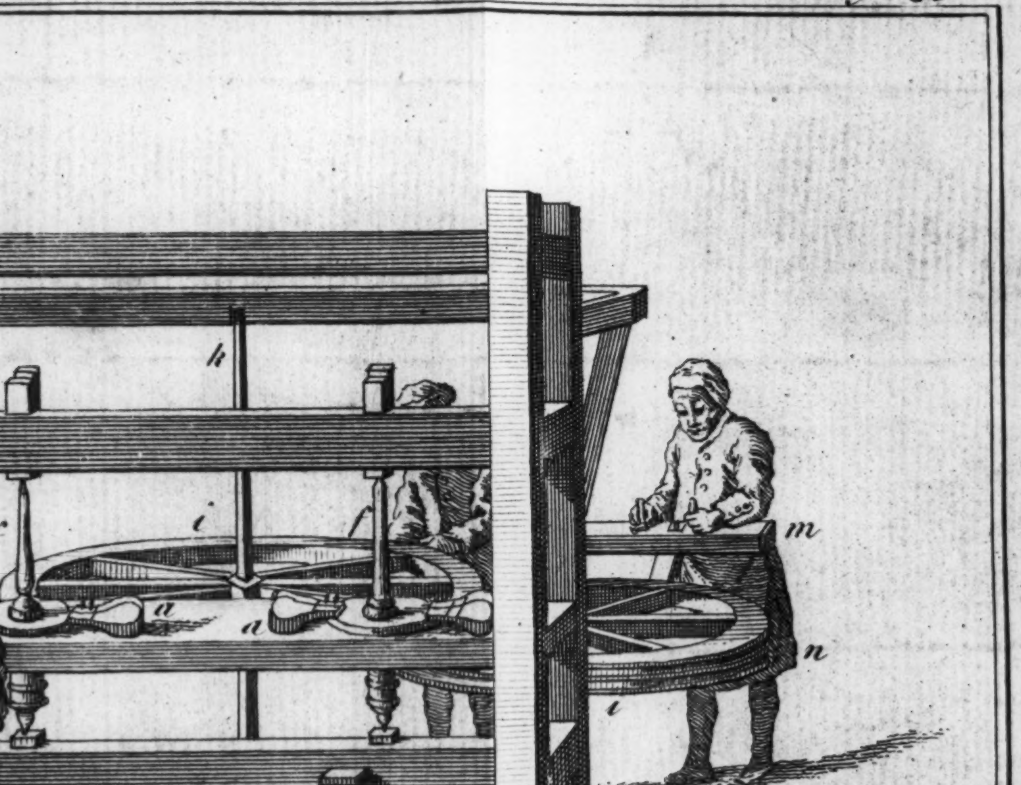
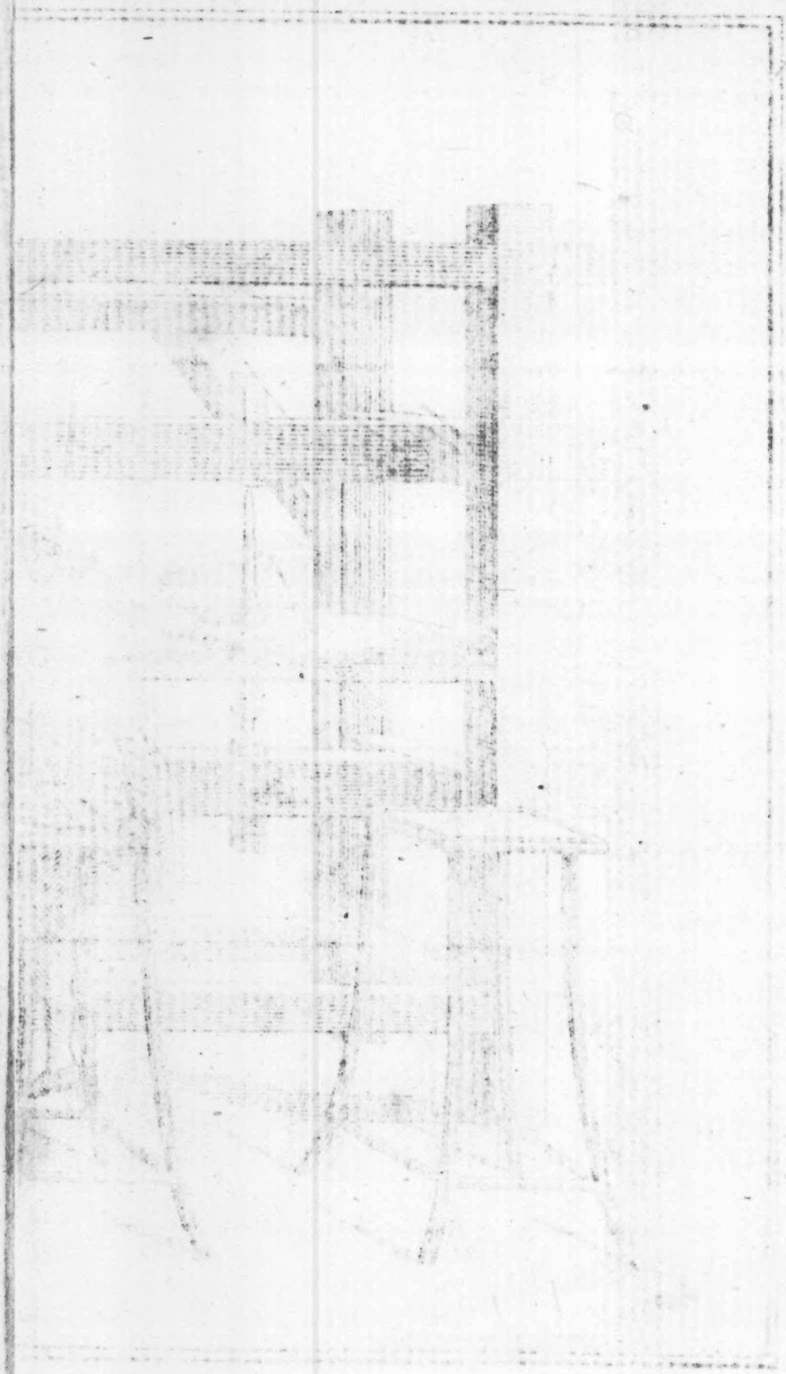


ters Wheel or Mill



by Means of the Elbow of its Axis, The Elbow of the Piercer wherewith a Hogſhead is broached will give an Idea of this Kind of Motion.

n The Cat gut-ſtring that goes round both the Iron and the Wooden-wheels. If the Wooden-wheel is twenty Times larger than the Iron one, the latter ſhall make twenty Turns upon the Diamond whilſt the large Wheeel makes but one round its Tree or Axis, and whilſt the Boy gives, without any Reſiſtance, a hundred Impulſions to the Turning-handle, the Diamond experiences a thouſand Times the Friction of the whole Grinding-wheel. Notwithſtanding its Hardneſs it complies with the Deſire of the Diamond-cutter, who follows the Work with his Eyes, without taking any other Share in it than that of changing the Place of the Diamond to bite upon a new Surface, and of timely throwing upon it, with a few Drops of Oil, the minute Particles of the Diamonds firſt ground one againſt another to begin the Cutting of them. Diamond-duſt being the only Thing that has any Effect on that hard Stone.

The Engine for laminating Lead.

Metallurgy is of far greater Conſequence to Mankind than the Diamond-cutter's Work. It is a moſt noble Science, which embraces numberleſs Parts and Utilities, but which executes them all with Inſtruments; a particular Deſcription of which cannot be made but in many Volumes. You are not ignorant of the Manner of Wire-drawing Gold and Silver. We ſhall in Time ſee the Machines of our Mint-men. But, of the whole Fabric of Metals, I ſhall give you no other Part here than the Engine for laminating Lead. That Metal was formerly worked in a very imperfect Manner, when they ran it into Tables upon Sand: But, Thanks to the new Invention, it is now of infinite Uſe either for Fountain-pipes, or for Vaſes, Ciſterns, and Reſervoirs of Water; but chiefly for the maintaining of Terraſſes, and ſtill more for the Covering of large Churches, and royal Palaces,

1. The Uſe of laminated Lead ſpares generally one third Part of the Matter, and it is Half in Half in ſome other Works.

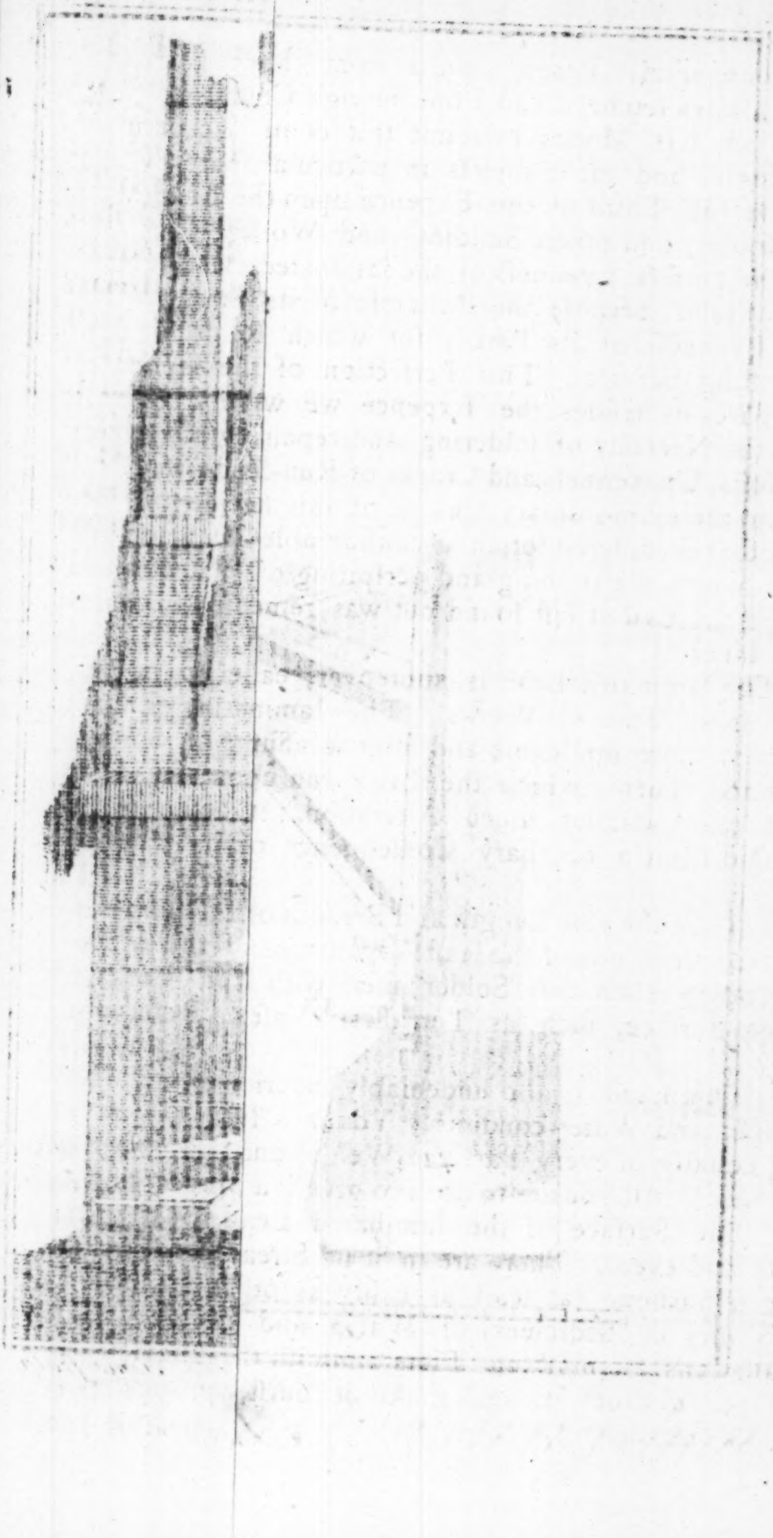
A conſiderable Benefit reſults from thence. *France*, which always fetches Lead from foreign Countries, ſhall have much leſs Money to remit thither on Account of that Article, and the Subjects in particular ſpare by that Means a full Third of the Expence upon the Leading of their Houſes, and other Buildings and Works.

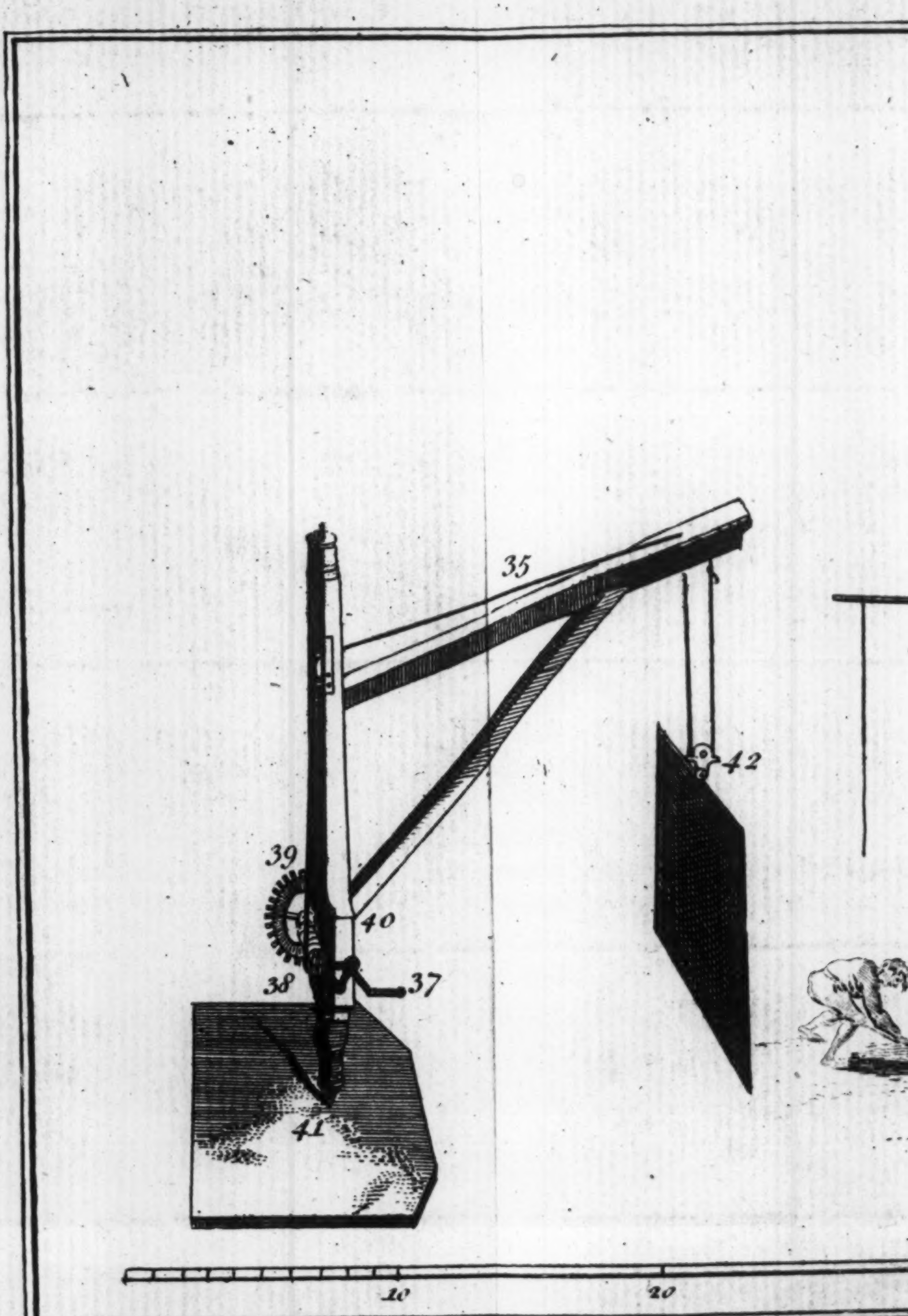
2 The perfect Evenneſs of the laminated Lead renders it more ſolid, becauſe the Principle of its Strength lies in the Evenneſs of its Parts; for which Reaſon it is of more laſting Service. This Perfection of the laminated Lead ſpares us beſides the Expence we were frequently at, by the Neceſſity of ſoldering and repairing afterwards the defects, Unevenneſs and Cracks of Run-lead: But, laying aſide the extraordinary Charge of this accidental Repair, Edifices ſuffered often a conſiderable Damage and Decay, which the running and perſpiring of Water cauſed there till the Evil at laſt found out was remedied in a proper Manner.

3. The laminated Lead is, moreover, eaſier to be employed in all Sorts of Works. The laminating Engine renders it more malleable and fitter to aſſume all Sorts of Forms and Turns, which the Lead run upon the Sand cannot take without much Alteration, it being brittle and rigid from a neceſſary Conſequence of its Unevenneſſes.

4. Nor are the vaſt Length and Breadth of the Tables of laminated Lead one of the leaſt Advantages of this Metal: There being much leſs Solder uſed with it in Works of a large Surface, ſuch as Terraſſes, Vaſes, Reſervoirs, &c.

5. This Lead is alſo undeniably ſuperior to any other for Pipes and Water-conduits. You are ſure of its reſiſting equally in every Part the Weight and Impulſion of the Water. All you are to do is to give it a proper Thickneſs. The Surface of the laminated Lead is extremely ſmooth and even. There are in it no Streaks or Cavities that can harbour (at leaſt as eaſily as other Lead will) the Slimes or Sediments of Water, and occaſion ſuch Incruſtations as muſt in Time diminiſh the Diameter of the Pipe, obſtruct it, and make it burſt, or render it perfectly needleſs.





The Casting-h

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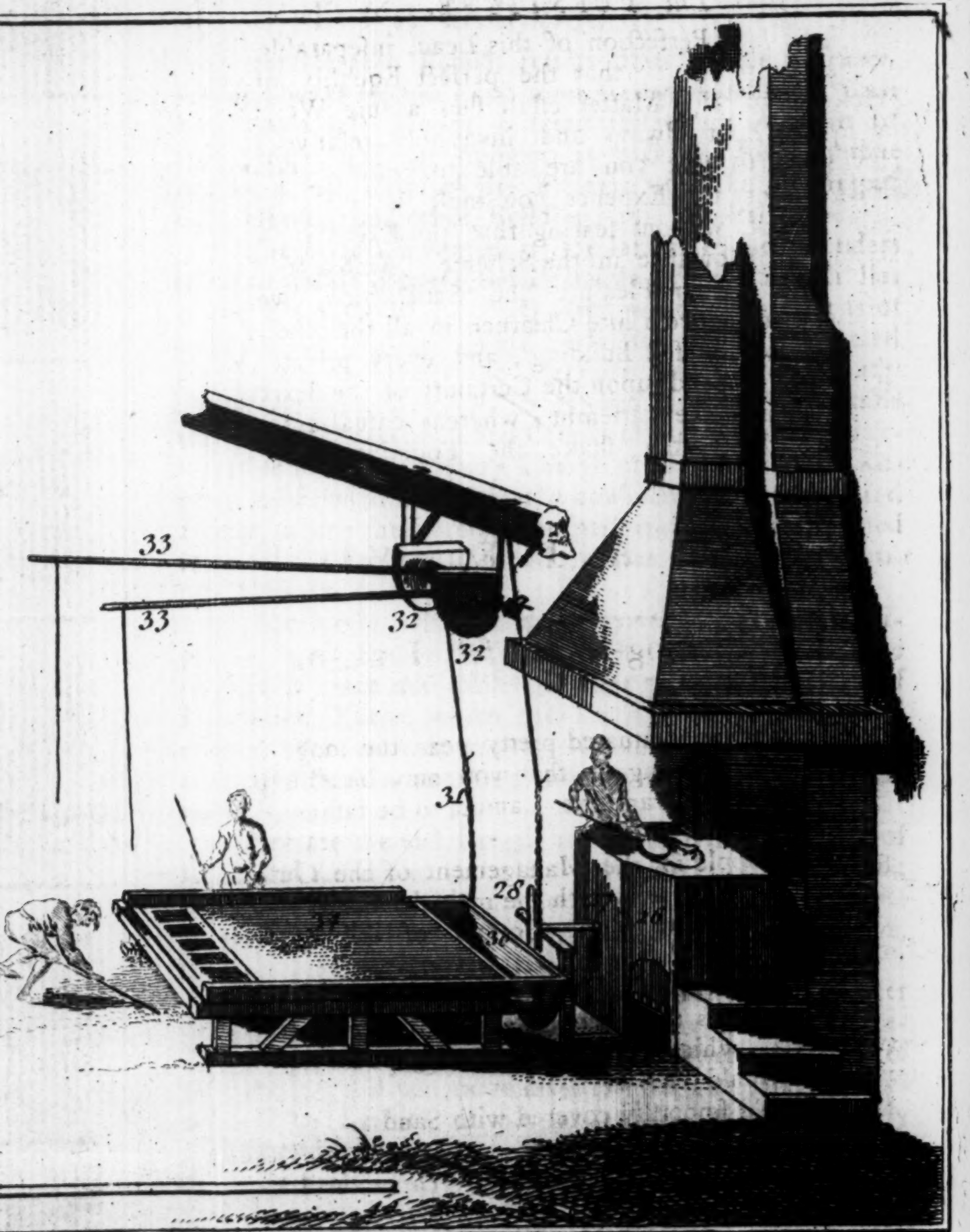


Toms ſculp.

g-house for Lead.

6. The laſt Perfection of this Lead, inſeparable from all the foregoing, is that the perfect Equality of the Thickneſs of this Matter eſtabliſhes a ſure Weight of the ſquare Foot always and invariably relative to its Thickneſs; ſo that you are able to know beforehand with Certainty the Expence you muſt be at for any intended Work, without fearing that the Execution ſhould exceed the Allowance in the Scheme. Architects would work with greater Pleaſure and Satisfaction, were it poſſible to introduce a like Clearneſs in all the other Parts of the Expence of a Building; and every private Man might alſo depend upon the Certainty of the Execution of the Projects they attempt; whereas caſual unforeſeen Expences very often ſhake the Foundation of their Fortune.

PLATE IV.

The Caſting-houſe *for* LEAD.

1. The Furnace, ſituated pretty near the long Frame of the laminating Engine, that you may be able to put in it by help of a Crane the Lamina to be faſhioned.
2. The Gullet.
3. The Stopple for the Management of the Gullet.
4. The Trough into which the melted Lead is poured.
5. Chains faſtened to the Bottom of the moveable Trough without.
6. The Half-wheels to raiſe the Chains.
7. Two Sweeps to heave up the Half-wheels, Chains, and Trough; which laſt, by inclining, pours the Lead upon the Mould.
8. A Mould ſmoothly covered with Sand.
9. A Chimney.
10. A Crane turning at pleaſure to carry the Lamina, and put it on the Frame.
11. The Turning-handle of the Crane.
12. The Bolt to ſtop the Crane, and keep the Sheet of Lead ſuſpended in the Air.

13. An indented Wheel with its Roller, round which the Cord is gathered.

14. A Pinion moved by the Turning-handle; it takes into the intended Wheel, and thus puts the Roller, the Cord, and the Sheet of Lead in Motion at once, by Means of a Couple of Pullies. This Pinion lies hidden behind the Arbor.

15. An Arbor perpendicularly erected, and turning round upon two Pivots.

16. The Sheet of Lead eighteen Lines thick, ſix Feet broad, and ſomewhat longer.

PLATE V.

The Laminating Engine.

The Excellence of this Machine conſiſts in its Effect, and the Uniformity of the Work of the Horſes, whilſt the Machine is alternately going on two oppoſite Ways.

The effect of it conſiſts in thinning a Sheet of Lead, an Inch and a half thick, ſo as to make it ſeventeen Times ſix Feet longer and better, by bringing it to the Thickneſs of a Line, and making it conſiderably longer, if you think proper to render it as thin as a Sheet of Paper, the Breadth being conſtantly the ſame.

This Table lengthens and is cut in Proportion to its lengthening upon a Frame fifty Feet long, Half of which Space it runs over one Way, and the other Half the contrary Way, going backwards and forwards between two ſtrong Cylinders of Metal, which turn one Way till the Lamina is at an End; and then turn the other Way to bring it back again, the Horſes and Engine always going in an uniform Manner; which will be underſtood by the Inſpection of the ſeveral Pieces of the Machine.

1. The vertical Arbor with its Levers, at the Extremities of which the Horſes are tied.

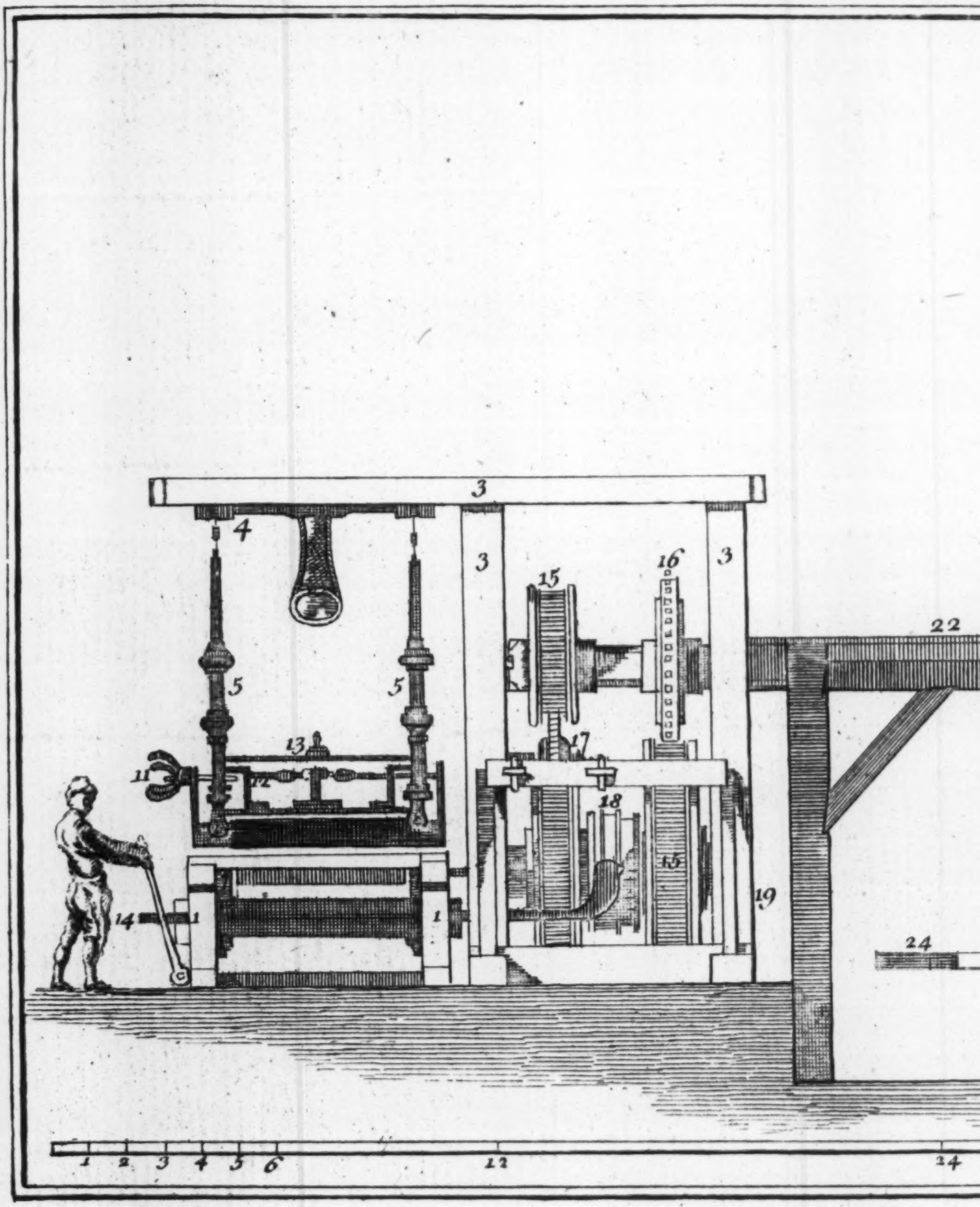
2. The Springing-wheel.

3. The Trundle-head with its horizontal Tree.

4. A Cant-wheel turning with the horizontal Arbor.

5. A Trundle-head turning the ſame Way.

6. Another Trundle-head moved by the Cant-wheel 4, and turning of courſe the contrary Way.



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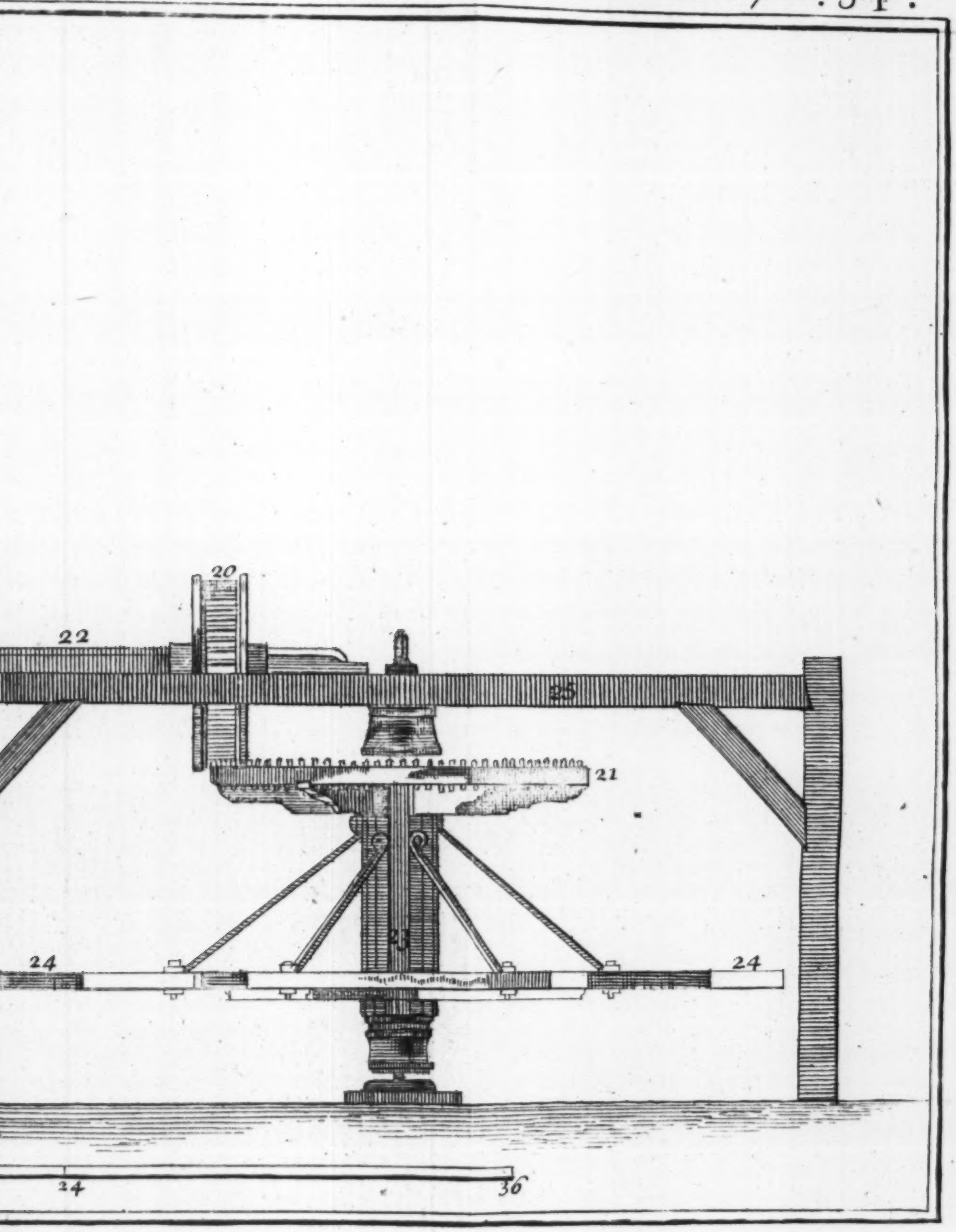


Ingine .

7 A Trundle-head driven by the returning Wheel 8, which plays between the upper Trundle-head 5, and the inferior 7. This laſt goes then the ſame Way as the upper one 5, and always contrary to the Trundle-head 6.

8. The Trundle-heads 6 and 7 embrace one Arbor: But they may both of them turn without bruſhing againſt it. They give no Motion to it of themſelves.

9 An Arbor, having a Bolt which may go into the Trundle-head 6, or in that mark'd 7. When this Bolt is thruſt into the Pieces of that marked 6, then the Arbor is faſtened to it, and ought of courſe to turn with it: And as this Arbor is fixed at its Extremity to the End of a Cylinder of Metal which is by the Side of it, the Cylinder goes the ſame Way as the Arbor: But the Bolt being taken out of the Trundle head 6, and thruſt into the Pieces of that marked 7, the Trundle head 6 goes on turning without making any Impreſſion on the Arbor which is now united to the Trundle-head 7, and turns with it the ſame Way. The Cylinder goes the like Way of Courſe. The Table of Lead, ſqueezed between this Cylinder and another above it, is hurried away by the inferior Cylinder, and forces the upper one to turn with it. When it is at the End the Bolt is taken off the Trundle-head 7, which continues to move the ſame Way without touching the Arbor; But this Bolt is already introduced into the Trundle-head 6, which makes now but one Body with the Arbor, and makes it go contrary to the foregoing. Therefore, the Lamina of Lead comes back again, always growing thinner and thinner.

Next to the ſmoothing of the Lead by the ſucceſſive Approximation of the Cylinders, nothing is more ingeniouſly contrived than this Bolt, which forwards the Work by the Conveniency of the two oppoſite Motions of the Lead without interrupting or changing that of the Horſes.

10. A Section of the long Frame that carries the Sheet of Lead.

11. The Regulator. It is a Combination of ſeveral Pieces which ſerve to raiſe or lower the upper Cylinder according to the Progreſs of the Thinning of the Lead.

12. A large Sweep, whoſe Counterpoiſe is a Mea s

to raiſe the upper Cylinder at a Diſtance ſomewhat leſs than eighteen Lines from the inferior, when a new Sheet of Lead is to be laminated.

13. A Sweep prolonged under the Frame, quite to the Bolt at 9, by Means of which a careful Workman, at the Inſtant the Sheet of Lead has done moving between the Cylinders, makes the Bolt go one Way or other, according to his Manner of puſhing the Sweep.

PLATE VI.

The Laminating Engine *ſeen Sideways.*

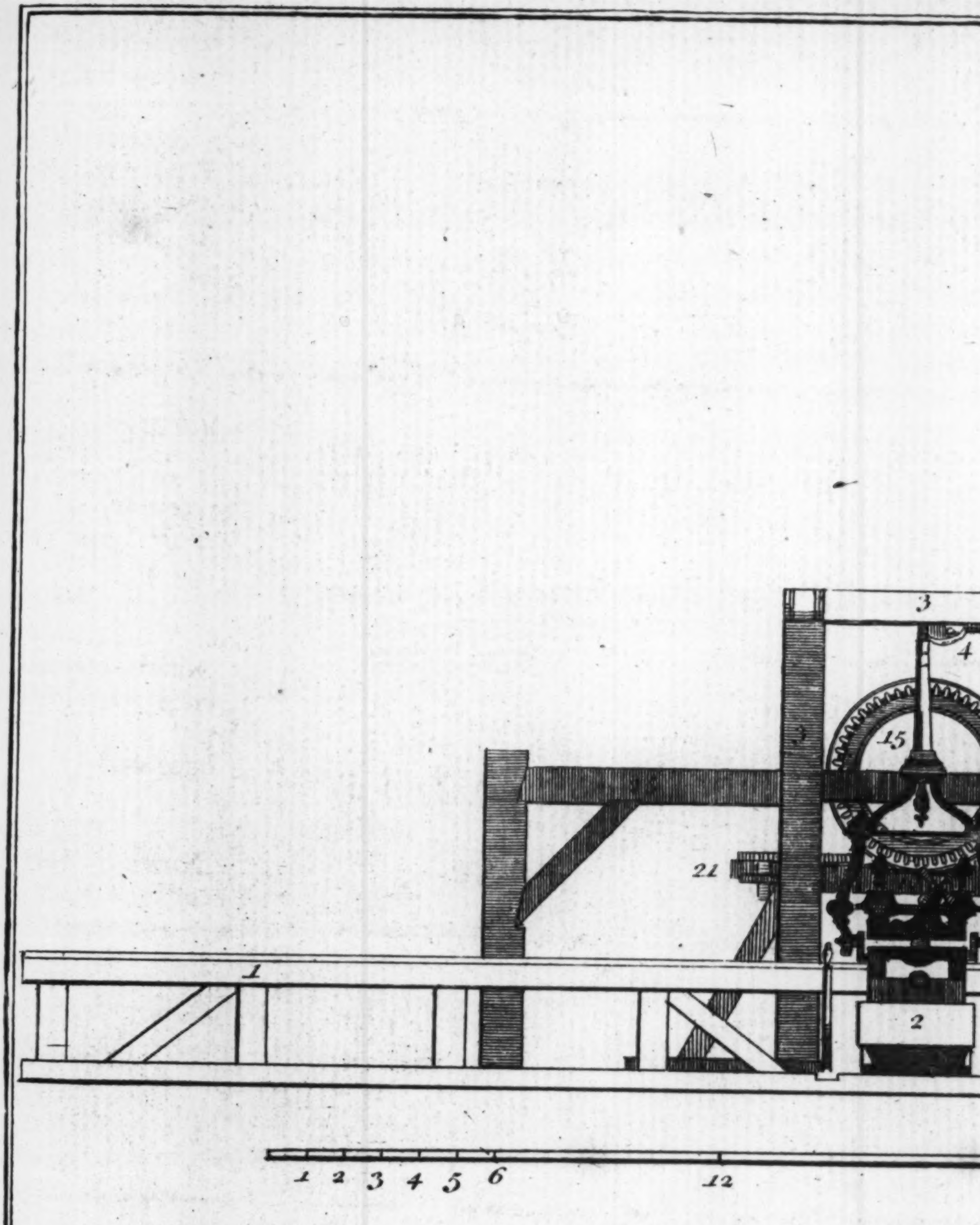
1. The Rolling-frame, along which lie ſeveral Rollers turning upon Pivots to help the Sheet of Lead to move backward and forward.
2. The Frame of the Sweep.
3. The Sweep of the Regulator.
4. The Regulator, all the Pieces of which concur to keep the upper Cylinder at any Diſtance from the inferior.
5. The Frame or Timber-Work of the Place where the Horſes go.
6. The Spinning-wheel.
7. The above-mentioned Trundle head, Numb. 5, ſeen in Conjunction with the out-jutting Pegs of the Cant-wheel.

* * *

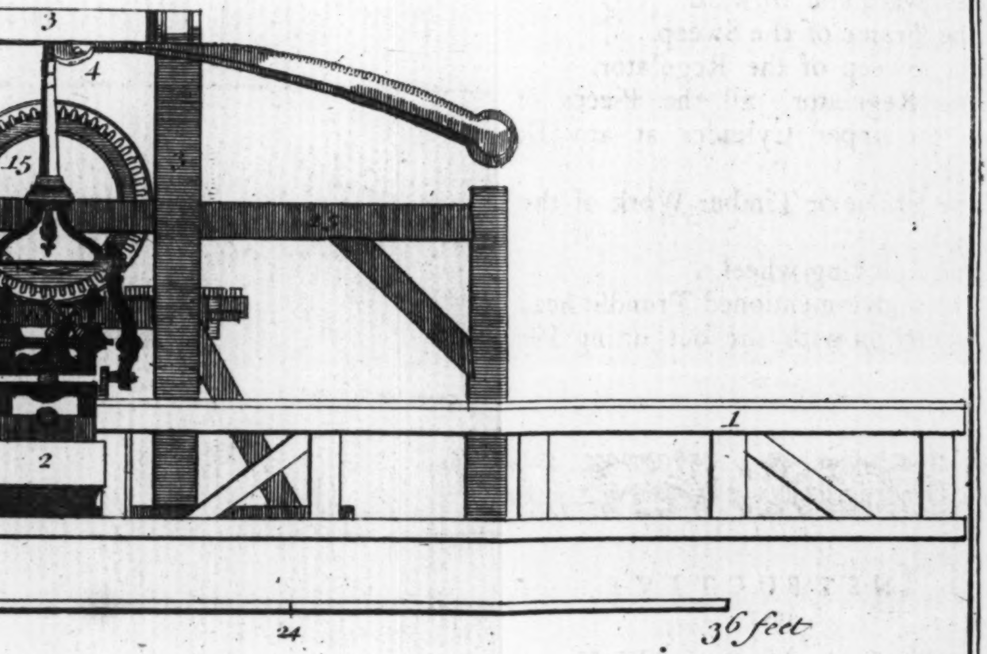
INSTRUCTIVE ARTS.

DIALOGUE XVII.

WHAT we have ſaid of our paved Roads, Markets, Sea-ports, and many other Parts of the Habitations of Man, we may alſo ſay of ſeveral Pieces of his Furniture, and chiefly of the Inſtruments which ſerve



The Plating-Engine s



Toms ſculp.

e ſeen ſide ways.

ſerve to inform him of what he wants to know. The major Part of them are poſſeſſed in common by all Mankind. The Road, through which the fineſt Oil is conveyed from *Aix* to *Paris*, is an effectual Reunion of both theſe Habitations. It is the ſame with an Advertiſement poſted up in both Towns, which equally gives Notice, in either of them, of three Ships ready to ſail for the Sea-ports in the *Levant*. This public Notice has the double Effect of awakening the Merchants of *Paris*, who may be diſpoſed to take Part in the Enterpriſe, and of cauſing ſuch of the Province to beſtir themſelves, as are deſirous to let out their Money to Advantage. But, let the Inſtruments, which ſerve to inform us of things, be only perſonal to us, or fit to inſtruct all Mankind; they are, as well as the reſt, Productions of the human Mind, and the Support of its Government. Nay, they are perhaps the fineſt and moſt fruitful of its Inventions.

The Inſtruments that communicate Light to us.

Light is the firſt Means by which God informs Man of what concerns him. It was created before all the Inſtruments that direct towards us; nay, before the Sun itſelf, which, though it does not produce it, yet renders it ſenſible by puſhing it towards our Eyes; juſt as the Spark, which is ſeen a hundred Paces about, puſhes the Light it ſwims in that Space, though it does not procreate it out of its Boſom. It is even more poſſible for a Spark to produce an Effluvium of Subſtance capable of filling up a cubic Space of a hundred Yards over, than it is poſſible to conceive that the Sun has for ſix thouſand Years together fetched out of itſelf, without being exhauſted, a Matter always new, which, after a few Minutes, fills up again the immenſe Space which extends quite to the ſtarry Heaven: And that Philoſophy, which blames *Moſes* for having made the Birth of the Body of the Light of more ancient Date than that of the Sun, is at preſent generally exploded: It is becauſe this admirable Subſtance is conſtantly around us, even when the Sun has, on Account of the Interpoſition of the terreſtrial Globe, ceaſed to direct it towards us; that the human Mind has ſought for and very luckily found out ſeveral Means of reviving, even in the Middle of the moſt profound Darkneſs, the Action of the Light become dim, or perfectly inſenſible. Man acts upon Light, and Light acts reciprocally upon him, when he makes it ſparkle by the Colliſion of a few Particles of Fire engaged between the Flint and the Steel; or when he kindles ſome combuſtible Matter, which no ſooner takes Fire but it begins to put the Fluid of Light in Motion, and continues to make us ſenſible of it; becauſe the Motion of the one laſts as long as the Inflammation of the other.

Whilſt the Sun is paſſing over our Heads, the Walls, that ſhelter us from the injuries of the Air, would deprive us of the Benefit of the Day, if ſeveral Profeſſions did not come in to our Aſſiſtance. The Glaſier, without admitting any hurtful Breeze into our Houſes, conveys the pureſt Light into them.

What we loſe Sight of, by turning our Head and Eyes from it, the Looking-glaſs-maker reſtores to our View and makes us perceive by the Concurrence of Rays, which the Poliſh of Glaſſes brings back to our Sight under an Aſpect contrary to their natural Progreſſion.

We have already ſeen the ingenious though very plain Inſtruments (*a*) with which the Optician unveils to us Things which were far beyond the Reach of our Eyes on Account of their enormous Diſtance, or exceſſive Smallneſs.

Other Profeſſions prepare us Flambeaux, or Illuminations ſufficient to replace, at leaſt within a ſhort Space round us, the Service of the Sun when he goes to give Light to the other Hemiſphere: The Action of the Light is not leſs at our Command for his being abſent, ſince we have in our Diſpoſal the Elements of Fire which finds Light already made, and acts upon it as ſuch.

The Lamp.

The moſt valuable of all the Inſtruments we can employ for this Purpoſe is the common Lamp, ſince it gives Light to three Fourths of Mankind. A Veſſel of baked Earth, a Match of Cotton coarſely ſpun, a few Drops of an unctuous Liquor preſſed out of the Seeds of ſome very common Plants, or made of the Fat of ſome terreſtial or aquatic Animals, are the eaſy Apparatus of the Luminary which ſuffices to

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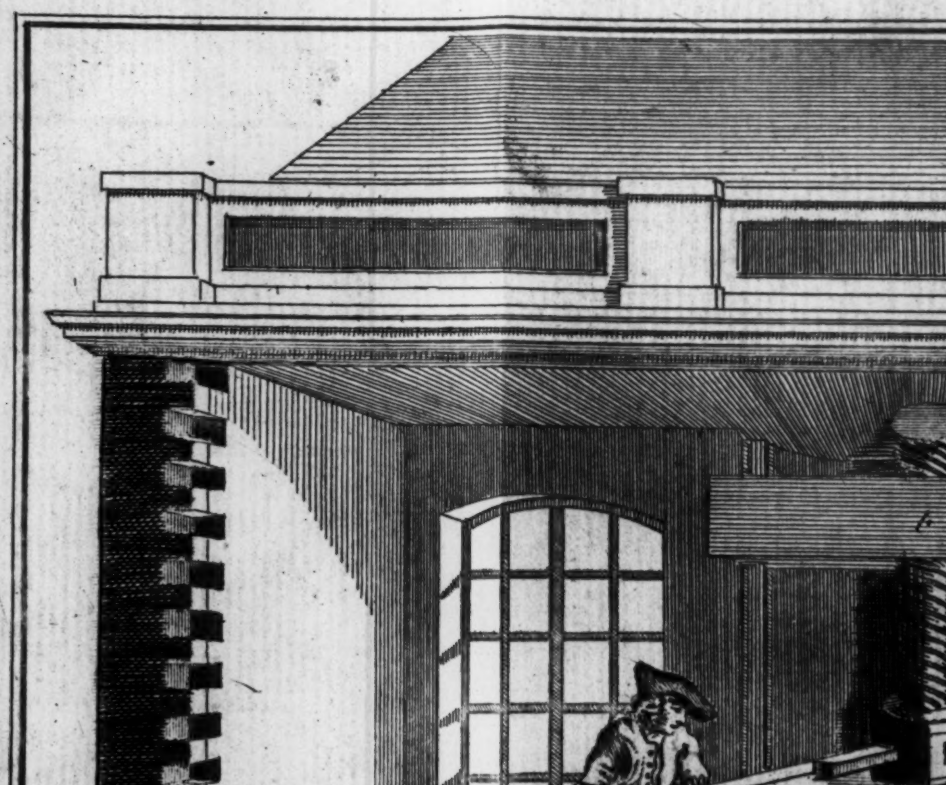
(a) See Vol. 5.



The Oil

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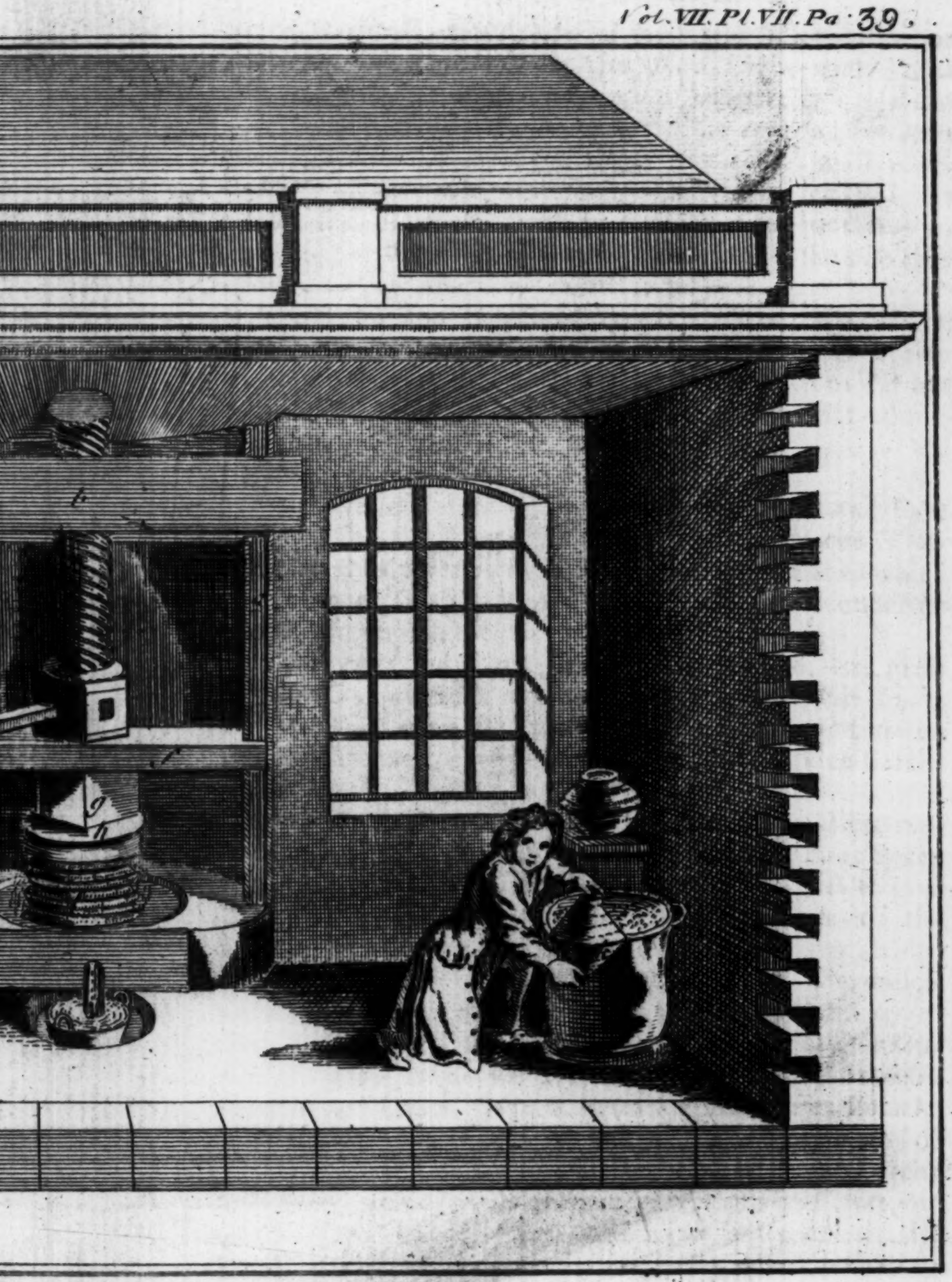

Oil Preſs.

enlighten moſt Nations. They formerly gathered and bound together Sprigs of reſinous Wood. But the Thickneſs of the Smoak and the Quickneſs of the Conſumption cauſed the Uſe of Flambeaux and Torches to be replaced almoſt every-where by that of Lamps. Oil has ſtill the Privilege of enlightening long Nights, and of embelliſhing the grandeſt Entertainments by vaſt Illuminations.

Olive-Oil.

The moſt perfect Oil is that ſqueezed out of the Fruit of the Olive tree. The Apparatus of the extracting it conſiſts in the Work of the Mill-ſtone, under which the Olives are bruiſed in the Beginning of Winter, in the Operation of the Preſs that ſqueezes the pureſt Oil out of them, and in ſome Care in the Management of it. I have ſent you here, Sir, the Figure of the Oil-preſs as I received it from *Provence.*

PLATE VII.

The OIL-PRESS.

a, *a*, The upright Beams, or Cheeks.
b. The Female-ſcrew.
c. The Male-ſcrew.
d, The Nut of the Screw.
e. The Bar.
f. The Board or long Form which the Screw preſſes upon.
g. A cubical Piece of Wood, called a Block.
h. The Peel, a circular Board to be put under the Block.
i, *i*, Several Sacks in a Pile, called in *French Scouſin.* That marked *k* is a ſmall Sack open at both Ends. It is woven of a Kind of Ruſhes brought from *Alicant* to *Marſeilles.* Theſe Ruſhes are flatten'd by a Mill-ſtone, to make Cords and other Weavings with them.
K. One of the Scouſins lengthened.
L. Another Scouſin flattened.
M. The Trough (in French *Maye.)* A hollow Stone to receive the Oil, and inclined, that the Liquor may run out of it.
N. The Pail.

They begin with cleaning and picking the Olives. Theſe are bruiſed in a round Trough, under a Mill-ſtone, rolling perpendicularly over them, and having its Axis faſtened to a turning Arbor. This Trough, like that in which they bruiſe Apples, before they are carried to the Cyder Preſs, is called the *Marre*. A Boy called the *Diablotin* (a little Devil) attends the working of the Mill, and with a Shovel brings the Olives within the Sweep of the Mill-ſtone, which is called *Feeding the Mill-ſtone*. When they are maſhed, one of the Workmen takes a *Scouſin* or Sack, the inferior Mouth of which he keeps ſhut by ſupporting it on the Hollow of his right Hand. With the left he fills it with maſhed Olives, and then puts it on the Middle of the *Maye*, He brings a ſecond, puts it on the firſt, and thus heaps ſix or ſeven Sacks one upon another. They put the Peel and Block at Top of the Whole, and then four Men laying hold on the Bar, which is in the Nut of the Screw, they preſs down the long Form, till all the Liquor is ſqueezed out. This is what they call the Virgin Oil.

The common Oil is that whoſe Quantity is increaſed by pouring hot Water on all the Sacks. The Bucker, filled up with what comes from it, is emptied into a large Tub, in which the Oil ſwims at Top in three or four Hour's Time, and is taken out with a Tin Leaf, cut in the Form of a Spoon. When the Cold hinders it from coming up to the Surface, the Effect is procured by a few Pails full of hot Water. The Dregs of theſe Tubs run out into a ſubterranean Drain, called Hell, which is ſurveyed regularly, to prevent the Putrefaction of the ſaid Dregs. What is extracted out of it is the meaneſt Oil. They call it Hell-Oil.

There are a great many other Seeds, out of which they extract Oils fit to burn: And it muſt be confeſſed that Burning in Lamps the beſt Oil of *Aix* and *Oneglia* is the worſt of Uſes it can be applied to. There are, however, a great many People, who, on Account of both the Look and Smell, will prefer the burning of Olive Oil, to any other Light. It is an eaſy Matter to increaſe its Brightneſs, without making the Match over big; by preſenting to it a Glaſs Globe full of Water, or a Kind of Hat opened at Top, for the venting of the Smoak, and having its Sides ſomewhat divergent, in order to cauſe the Rays of the Light to concur, not indeed in one Focus exactly, but within ſuch a Space, as may take in the whole Bulk of the Object you work upon.

Candles.

The Apparatus for making of Candles conſiſts in an exact and proper Mixture of Mutton-fat, with that of Bullocks or Cows, half one, half the other, and in the Manner of covering a Match of Cotton of a middling Size, with theſe melted Matters.

Dipt Candles.

Candles either dipt or moulded. Thoſe dipt, are Matches firſt hung upon Sticks, and then dipt ſeveral Times ſucceſſively, into a long, narrow, deep Veſſel, called, in *French*, the *Abyſs*; which is always kept full of melted Tallow. Theſe Candles are formed in it by ſeveral Lays of Fat being let down by turns into the Veſſel, then cooled, till they have acquired the requiſite Size and Hardneſs.

Mould Candles.

Mould-Candles are caſt and formed in an Inſtant, in a Mould of Metal, of Braſs, for Inſtance, of Lead, Tin, *&c.* Pewter is the Metal that gives them the fineſt Look, on Account of its fine Grain. The Mould is ſituated with its Head downwards, and faſtened in one of the Holes, with which the large Table of the Work is bored. They with an Iron Needle introduce a Match or Wick into it, that comes out at one End, through the ſmall Aperture of the Head of the Mould, and is brought to the other End, where the loweſt Part of the Candle is to be, into a Kind of a ſmall Funnel, which is jointed into the opened Extremity of the Pipe. This melted Tallow, being poured into this Funnel, runs through it, and ſurrounds the Match, by filling the whole Cavity of the Mould, where it coagulates immediately. The Funnel, when taken off, by means of the Match which traverſes it, pulls out the Candle along with it: They put them aſunder, and the Candle, cut ſmooth at Bottom, is cooled as well as the dipt Candles. Both Kinds are conſiderably improved, by being whitened in the Dew and Sun. The latter carries away by Evaporation, not only the Drops of Dew that ſtick to them, but alſo the heterogeneous, foul Matters which have been waſhed by the Moiſture.

Wax.

Wax is properly that unctuous and, in ſome Senſe, unalterable Subſtance, of which are compoſed the Corpuſcles which fall from the Tops of the Stamina upon the Piſtil of Flowers, and which contain the Spirit appointed to communicate Life and Fruitfulneſs to the Seeds in the Womb of the Piſtil. Our former Ignorance of the Uſefulneſs of the Seeds, which the Microſcope ſhewed us to be moſt regularly organiſed, cauſed them to be called *Farinæ*, as though they were but an Excrement, evacuated by the Plant; whereas they are, together with the Semen, the moſt perfect Part of it. Nothing then being more common than Flowers and their *Farinæ*, Wax is a moſt abundant Subſtance in Nature. But, we have not as yet found any other Means to collect and fit it for our Service, than by the Tools and Work of the Bees; and Wax becomes ſcarce when theſe winged Artiſts are wanting. We depend upon them the more for this Proviſion, as Mr. *de Reaumur* has lately obſerved, that Wax acquires its perfect Conſiſtence no otherwiſe than by paſſing through the Body of the Bee, who would periſh if ſhe had only Honey to feed upon; and has Veſſels in her appointed to perfect the rough Wax, as ſhe has others fit to refine and perfect her Honey.

The whitening or bleaching of Wax.

The whitening or bleaching of Wax is the firſt Operation, before Tapers and Candles are made with it. It is impoſſible to change the Colour of a Wax-Cake into half white, and then bring it from that State to the utmoſt Degree of Whiteneſs, without cutting the whole Cake into a Multitude of thin *Laminas*, in order to multiply the Surfaces, and ſubmit the Inſide, as well as the Outſide, of the Wax, to the Action of the Air. This Diviſion of the Wax into an infinite Number of thin, ſtraight Ribbands, which, it ſeems, muſt be both long and difficult, is, however, executed in an Inſtant, and by a ſimple ingenious Method. (*a*)

The yellow Wax, melted in a large Copper, is received, and kept in Fuſion in a Wooden Tub, raiſed five or ſix

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(a) See Antoni's Manufacture, near Bourg-la-Reine.

Feet from the Ground, and wrapt up in a good many thick Blankets of Wool. The Liquor runs out of it through a wooden Pipe, fixed higher than the Sediment of the Grounds which remain at Bottom; it is received in a bored Cullender, which lets it go through its Holes, and only retains all the Dregs; from the Cullender the Wax runs into the *Greloire*; which is a long narrow Trough, bored at the Bottom with about fifty ſmall Holes, ranged in one Line, and ſeparated by equal Spaces. The Wax, diſtributed in its Fall by theſe Holes into fifty Threads, falls upon a Cylinder of Box, or of ſome other hard Wood; which is about five Feet in Diameter. This Cylinder is immerſed, about one Half of its Thickneſs, into the Water of a long Bathing-tub, at the End of which is a Child, who turns it with a Handle. You are ſenſible, Sir, though you have not ſeen the Operation, that each Thread of melted Wax muſt coagulate and grow flat as it comes upon the Cylinder dipt in cold Water. As this Cylinder is kept turning, a thin Lace muſt neceſſarily be formed of all the Guttulæ of Wax ſucceſſively flattened and cooled; which will go off the Cylinder, by the Action of the Water at its coming into it: And really, the Surface of the Water is, in an Inſtant, covered all over with theſe fifty yellow Ribands, which are formed upon, and inceſſantly ſpun off that Kind of Turn. They are taken away with a ſort of wooden Fork like a Trident, and carried to the Meadow to be ſpread, not indeed upon the Graſs, as they did formerly, but upon long wooden Frames, raiſed two Feet from the Ground, and covered with Oil cloth, where the Whole, ſcattered very thin, receives the Impreſſion of the Air, and chiefly the Dew; the Guttulæ of which, being carried off by the Wind and the Sun, hurry away with them the Mortar that tarniſhes the Wax. This firſt Operation brings it to the Half yellow Colour, called in *French Grelage*. From the Bleach yard it is carried back into the ſecond Copper, called the *Regrelage*; whence it paſſes into the ſecond Tub: and then into the correſponding Bathing-tub; whence it goes again to the Yard to be bleached anew; this ſecond Work being perfectly like the foregoing. Laſtly, they melt it in the third Copper, whence they pour it into a Tub, and thence into the Wax-pot, with which they next pour it, by Means of a Gullet, into Tin-porringers, to be afterwards diſtributed into round Moulds not over deep, where it coagulates into ſmall Cakes; theſe laſt grow hard in the Water of the Bathing-tub, into which they are flung, and then aſſume the higheſt Degree of White in a final Bleaching.

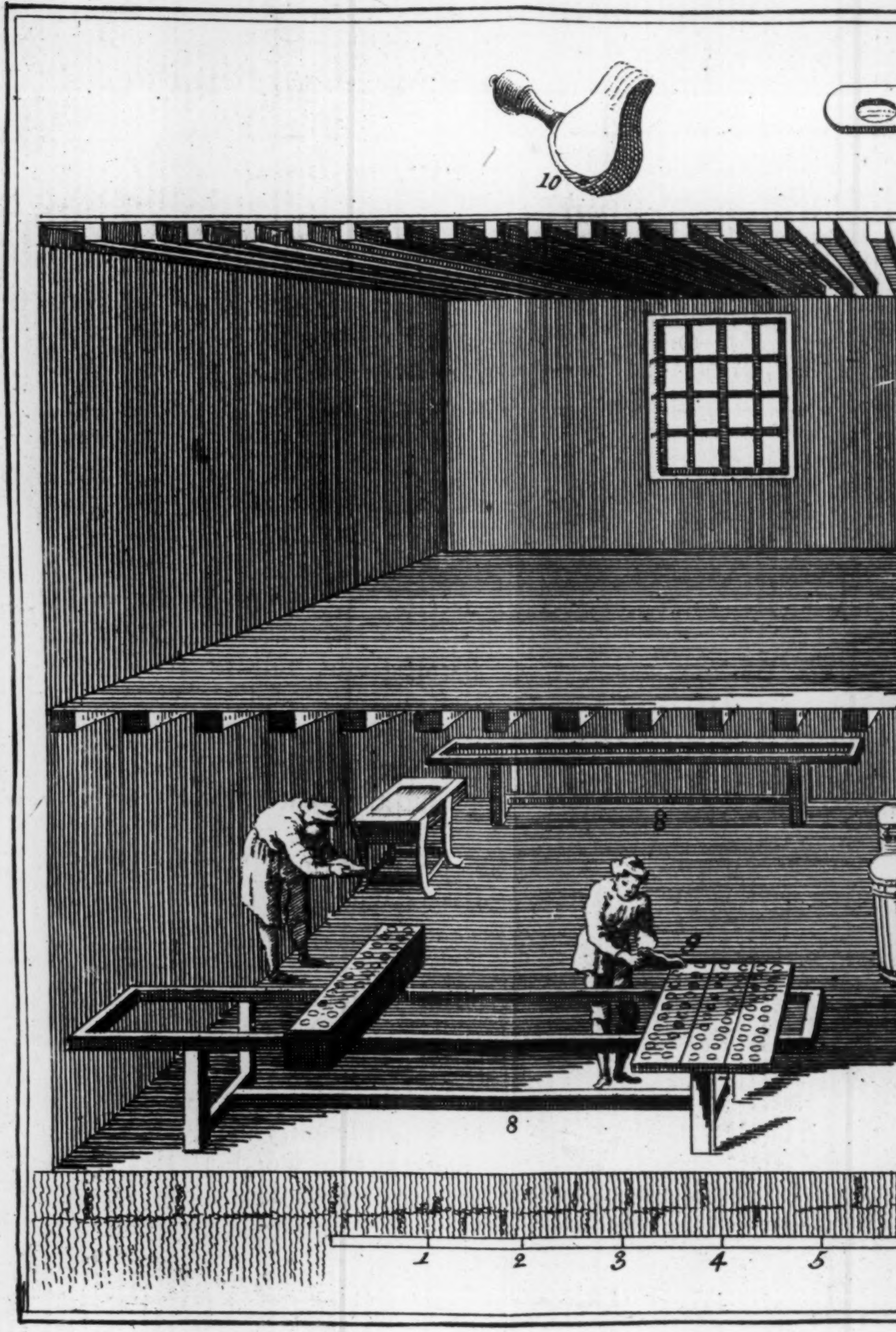
The Taper made with the Ladle.

The Taper is made either with the Ladle, or with the Hand. It is made with a Ladle, by pouring the liquid Wax upon a Match hanging over a Pan into which all the Wax that could not ſtick to the Wick falls again. New Wax is poured on it, keeping the Ladle gradually lower and lower; and the Wax, which is naturally inclined to cool, ſticks and coagulates better in the End than in the Beginning of the Pouring; ſo that the Taper grows thicker and thicker gradually, from the Top quite to its lower End, which is hollowed inwardly, by the Inſertion of a pointed Skewer.

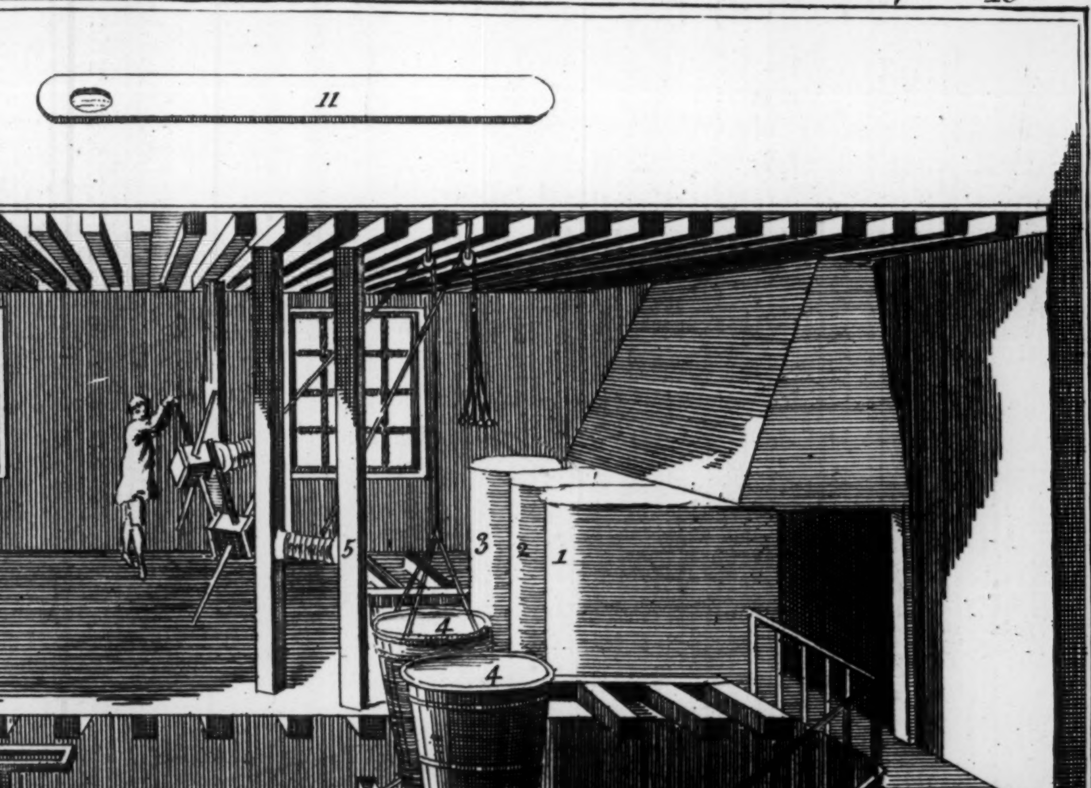
The Taper made with the Hand.

On the contrary, the Taper made with the Hand is begun at the lower End of the Wick, by applying ſoft Wax to it; they go on in this Manner, gradually leſſening the Bigneſs of the Taper quite to the Top. When the Taper is made either with the Ladle, or Hand, they carry it ſtill warm to a Walnut tree Table, where it is rolled or poliſhed on a Board, or Block of Box.

The Wax-candle is worked in the ſame Manner, all but the Shape, which is cylindrical, that is, of a Roundneſs perfectly equal quite to the Snuff. There are alſo other ſmall and pliant Wax-lights, of different Bigneſs and Fineneſs, according to the Quantity of Tallow, or even of Reſin they think proper to mix with the Wax. Theſe go by the general name of ſpun Wax; becauſe it is a Wick covered over with yellow, or white Wax, which is made to paſs through a wire-drawing Iron to give it the Poliſh, and its proper Degree of Bigneſs.



The Whiteni



tening of Wax.

PLATE VIII.

The Whitening, or Bleaching of Wax.

1. The *Grelage*; a Pan wherein the yellow Wax is melted. It turns there into Clots, or Grain; whence came the Terms *Grainer* and *Grenage*, which have afterwards been changed into thoſe of *Greler* and *Grelage* (*a*).

2. The *Regrelage*. It is the Copper, or Pan, where the half white dried Wax is melted.

3. The Pan to put the Wax into Cakes, or the third melting Copper.

4. The Wooden-Tubs with their Spiggots.

5. A Hand mill with its Axle tree, to pull up the Tubs full of melted Wax from the Supports, which attend the Coppers 1, 2, 3, and to let them down cloſe to the Bathing-tubs.

6. Two long Bathing-tubs full of cold Water, and having each their Extremity under the Spiggot of a Tub 4.

7. The Workman turning under the *Greloire* the Box Hand-mill half dipt into the Water, acroſs the Breadth of the Bathing-tub.

8. Several Tables having ſmall Cavities or Moulds, to receive the melted Wax which is poured into them with Porringers, and coagulates there into ſo many ſmall Cakes.

9 The Porringer in the Hand of the Workman.

10. The Wax-pot. The Workmen call it the porrenging Pot.

11. A Hand, or flat Bar to ſtir up the Wax-leaves and Cakes in the Meadow or Bleach-yard.

We put here neither the wooden Trident, nor the Wheel-barrows, nor the Frames which ſupport the bleaching Oil cloth: The whole being eaſily conceived.

(a) Very likely on Account of the Reſemblance the Clots of Wax have with Hail-ſtones, called in French Grole.

PLATE

PLATE IX.

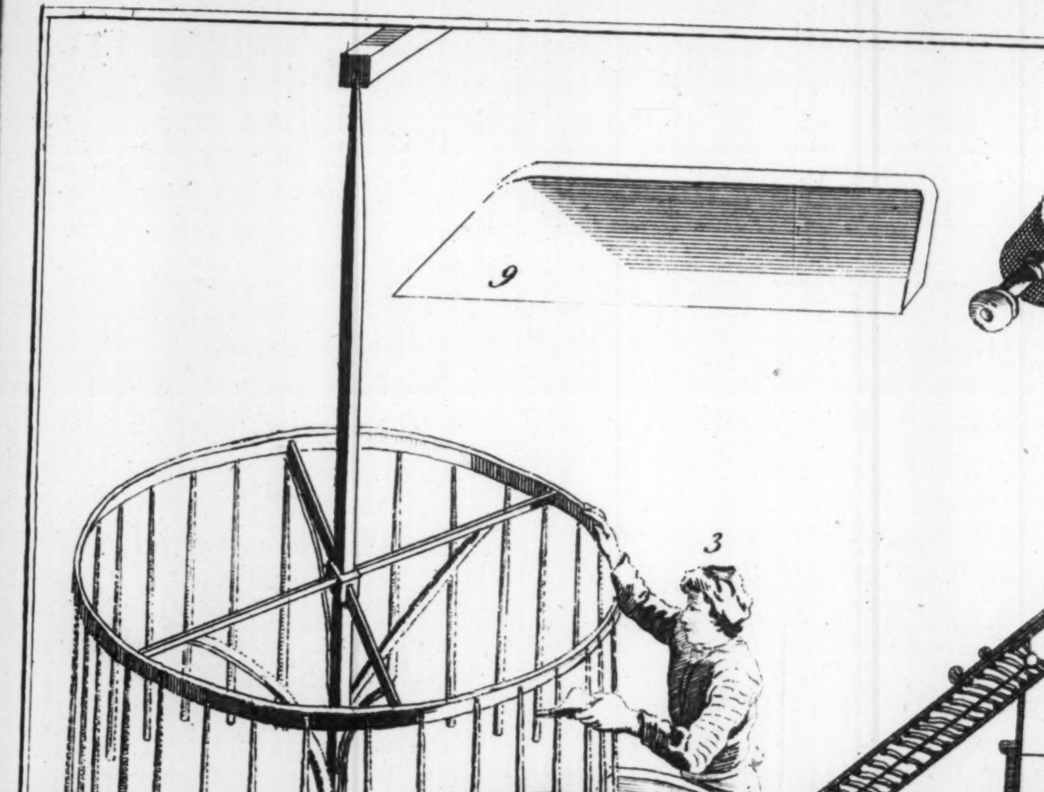
The making of Tapers and Wax-candles.

1. A tinned Copper-pan, where the white Wax is melted.
2. An iron Hoop with eight and forty Hooks which the Wicks hang on.
3. The pouring of Wax on the Wicks.
4. A Table to roll and poliſh the Tapers on.
5. A Workman rolling Candles.
6. Another Workman cutting the Foot of the Taper, and thruſting a wooden Peg into it, to make the Hollow that ſupports it on the Candleſtick.
7. The Walnut-tree rolling Table.
8. The Ladle to pour the Wax.
9. The Coulter to clean off the lower End of the Taper, or Wax-candle.

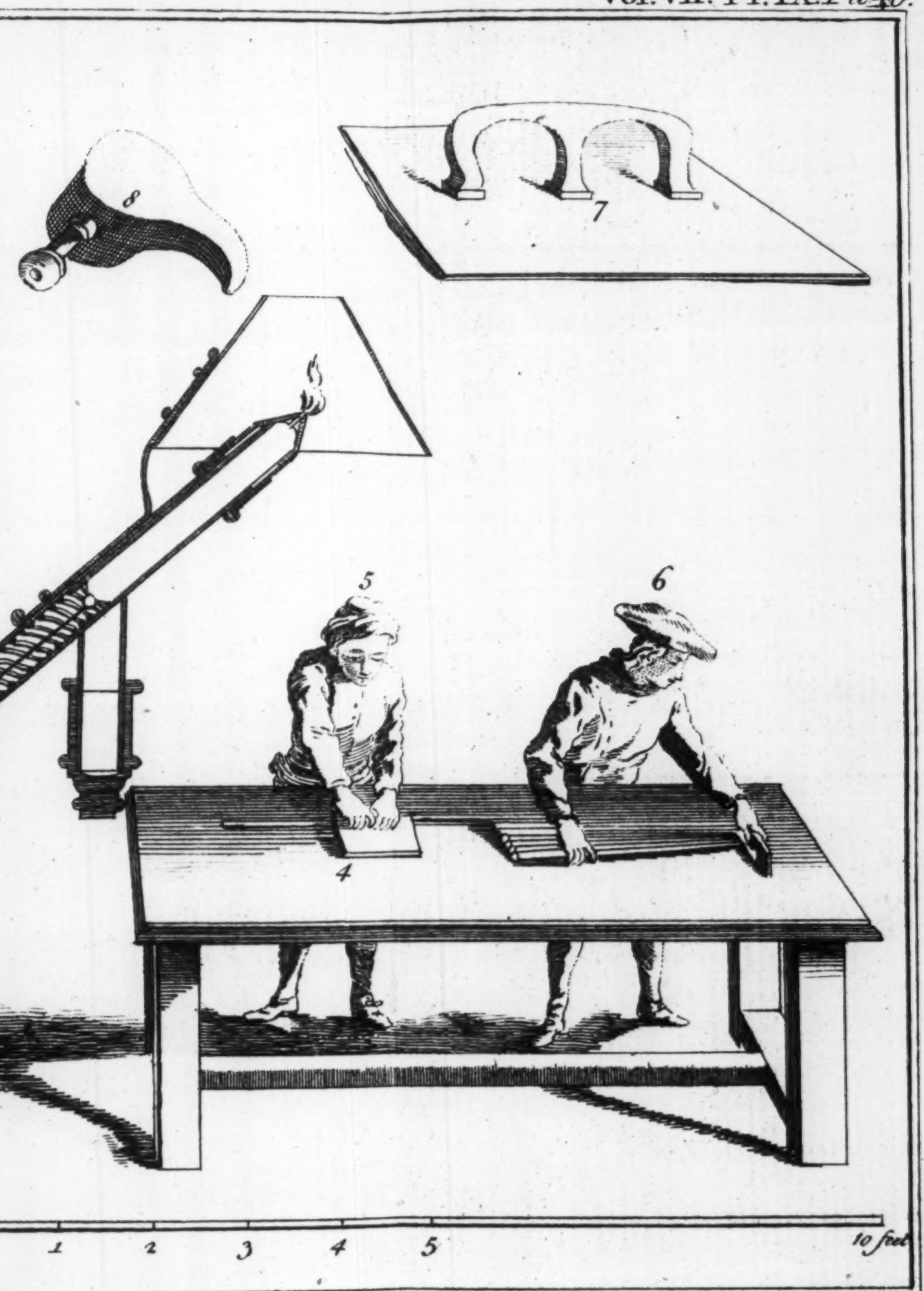
PLATE X.

Wax-Candles.

1. The Wick-cutter. It is a Table on which a ſharp unmoveable Blade is perpendicularly erected. A Bar with ſeveral Holes in it; and having an iron Peg, ſtanding upright with a male Screw, which ſlides into a Groove backwards and forwards, by the Side of the ſaid Blade. The Screw ſerves to fix both the Bar and iron Peg, at any Diſtance from the Blade. They fold the Wick into two, then fix it in the Peg, and bring it twiſted quite to the Blade, to be there cut of the requiſite Length. When the Peg is full of Wicks, the Whole is removed to have melted Wax poured on them.
2. Another Table, where the Neck, or Top of the Wicks of the Candles is introduced with a Slope needle, into a ſmall Iron-pipe, to hinder that Part of the Match taking Wax, the making of Wax-candles requiring this Precaution: becauſe they hang by their lower End on the

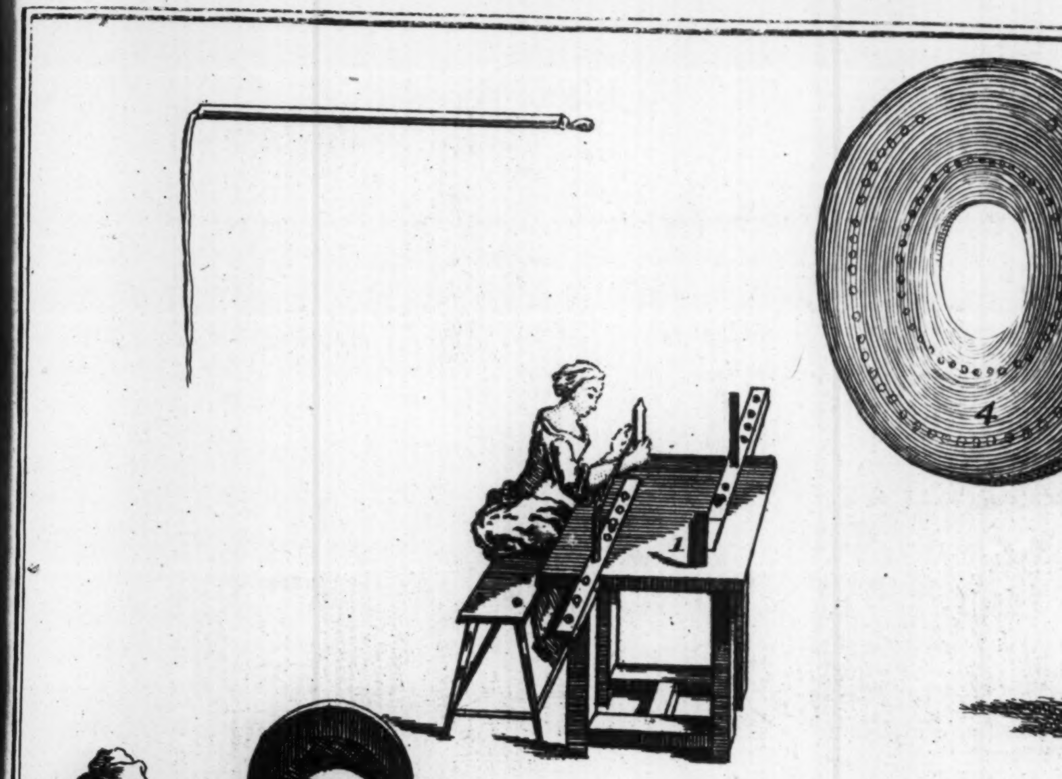


The Making of Wax-ta



Toms sculp.

x-tapers & Candles.



The Working of Wax in

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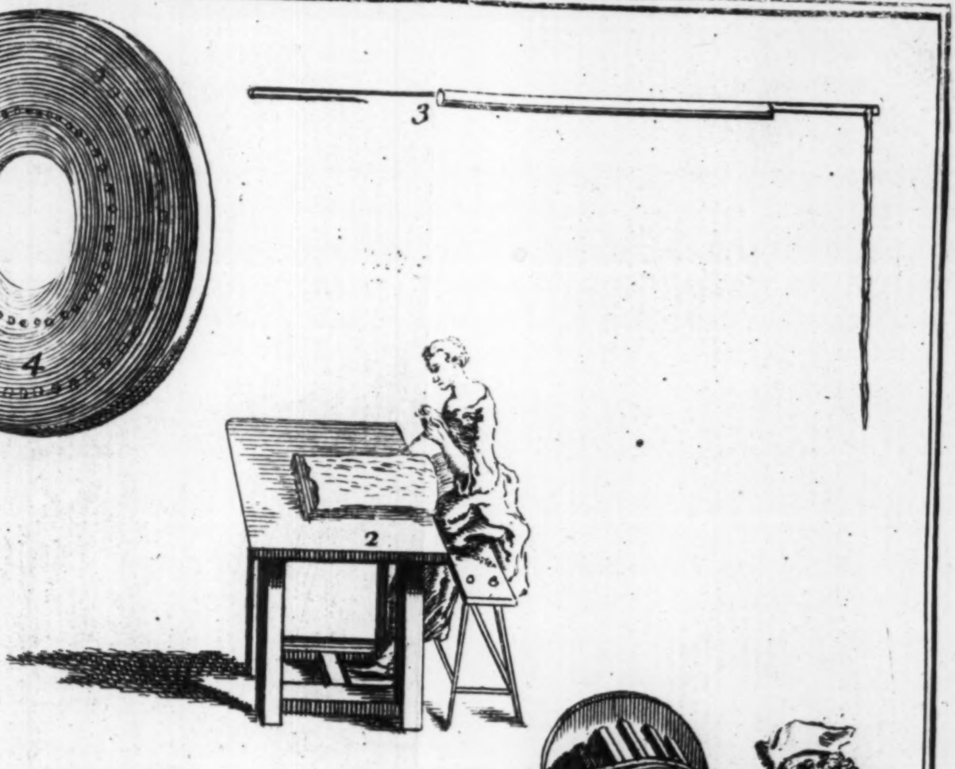


ax into Rolls.

the Iron-hoop, when the melted Wax is poured upon them; whereas Tapers hang on it by their Neck, where you may, at Pleaſure fix the Diſtance at which the Wax is to be poured on at firſt.

3. The Slope-needle with the Iron-pipe.

4. The wire-drawing Iron for ſpun Wax.

5. A Table with the Pan, wherein the Wax is melted for ſpun Wax.

6. The Pan.

7. The wire-drawing Iron in its proper Place, and ſeen Sideways. The Wick dips in the melted Wax, and paſſes at Pleaſure through the ſeveral Apertures of the wire-drawing Iron, which governs the Bigneſs of it.

8. The Turn.

The Candle and Candle-ſtick for a Study, revived by the Directions of Mr. De Molieres.

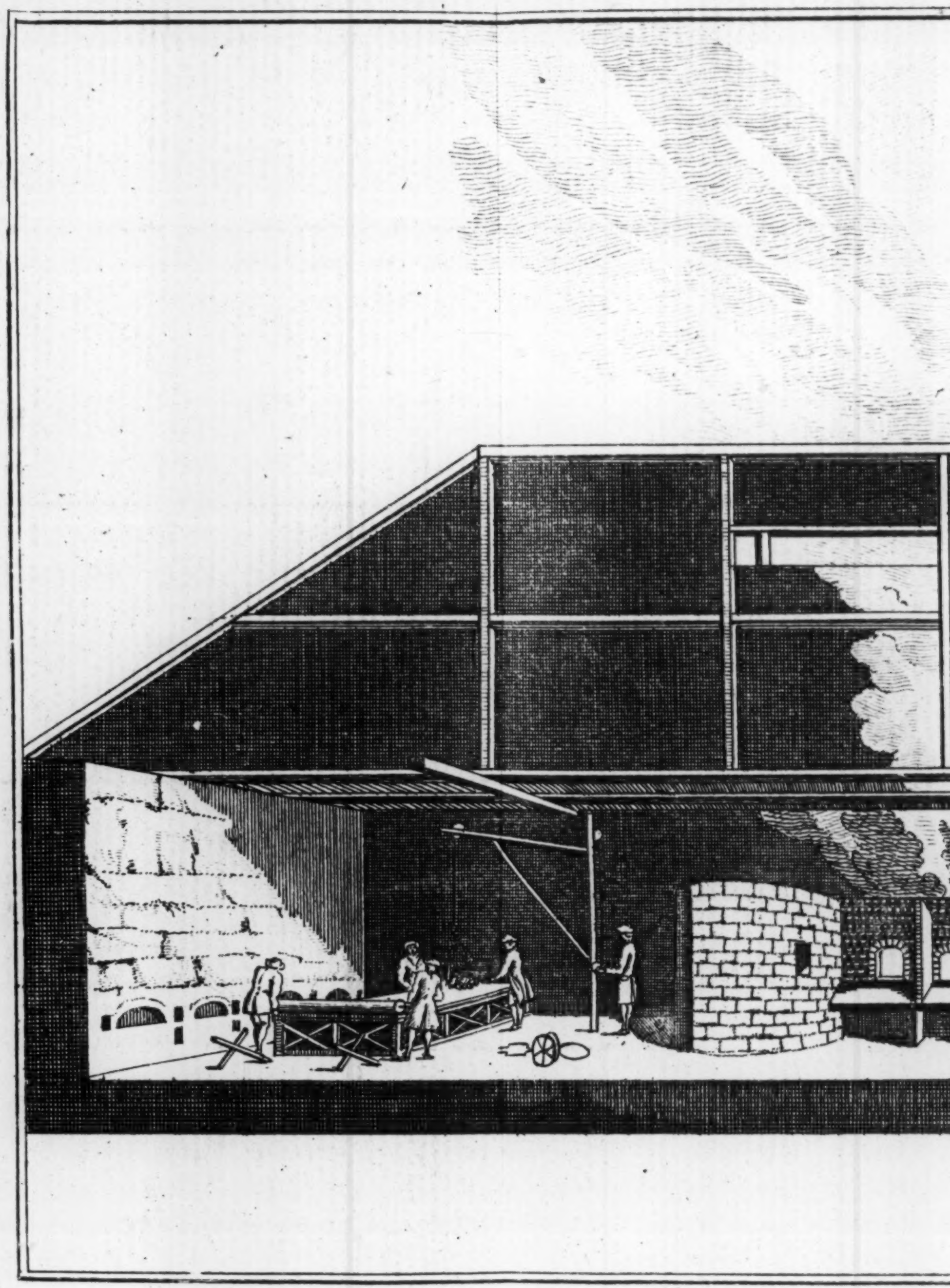
They have invented ſeveral Sorts of Supports fit to improve the Service of Light. They tried at firſt to render it briſker, by Means of a Reflection that might convey a greater Quantity of it upon the Place where you were at Work; after which, they endeavour to preſerve the Eye, by ſparing it the immediate Sight of the Flame that gives Light. The Light is all we want: The Flame ſerving only to hurt the Eye, by its Nearneſs and over-great Splendor. It has even been attempted, in Favour of thoſe who are for ſparing Expence, to render the ſmall yellow Wax candle, of ten, twelve, or even ſixteen in the Pound, equivalent to that of a white Wax-candle of ſix in the Pound. Beſides this, you have the additional Advantage of a Light always equal, and of breathing a pure Air; whereas a common Wax-candle is offenſive, and lays you under the Neceſſity of continual Snuffing, All theſe different Conveniencies have been tolerably well re-united in the new Study-Candleſtick, of which I ſend you the Figure. It may be put either upon a portable Support, or upon a fixt moveable Branch, by Means whereof you may have it higher or lower, and place it as near or as far as you pleaſe. The Spring, which bears againſt the Wax-candle, ought to be made of very fine and light Matter, like an iron or Braſs-wire, in order to be preſſed down without Reſiſtance, and without taking much Room in the Pipe. You may tie to the upper Part of the ſpiral Spring a String that goes quite through it, and is faſtened to a Ring at the other End; that the Ring, aſcending along with the firſt Spires, may be a Warning, that the Candle is nearly at an End; that is, when the Ring is ready to touch the lower Part of the Pipe. This Pipe will be inclined, and make an Angle of forty-five or fifty Degrees with the Horizon, or with the Surface of its Support; for, were it perpendicular, the Cover, whoſe ſloping Sides reflect the Light upon your Work, would caſt it all round the Foot of the Candleſtick, which would fill up the Center of the concurring Rays of Light to no Kind of Purpoſe: Whereas the inclined Pipe caſts the ſtrongeſt Part of its Light at ſome Diſtance from the Foot of the Stand, and collects it properly upon the Paper you are uſing. The Inſide of the Cover can never be kept too clean: But inſtead of having it ſmooth and bright (which cauſes a Light unequal and fluttering) they have it only of an unpoliſhed even White, like that of Paper, of *Spaniſh* White of a very fine Paſte board, or waſh'd over with Quick-ſilver. A Paper-cover has ſome Danger in it. Ceruſe is difficultly renewed, or kept clean: But the Waſh of Quick-ſilver is eaſily repeated, and of no Expence.

The Glaſs-houſes.

Next to the ſeveral Manners of preparing and working the oily Matters which inlight us during the Night, nothing excites the Curioſity and Gratitude of all Mankind, more than thoſe noble Inventions which convey the brighteſt Day-light into our Habitations, though, cloſely ſhut up; or, which preſent to our Eyes a true Picture of a Multitude of Objects, when it is naturally impoſſible for us to ſee them. Such are the Inventions of Flint-glaſs, of the Method of poliſhing Glaſs-ſconces, and of the Tin-leaf, or Foil, which converts them into Mirrors.

France had its Glaſs-ſconces formerly from *Venice:* And ſhe now ſupplies all *Europe* with them; and inſtead of Glaſſes forty or fifty Inches high, which ſhe formerly received from *Italy*, ſhe now ſends ſome thither, that are ninety, or even an hundred Inches long.

You know, Sir, that they are made of blown Glaſs, at *Tour la Ville*, near *Cherbourg* in *Low Normandy*, after the



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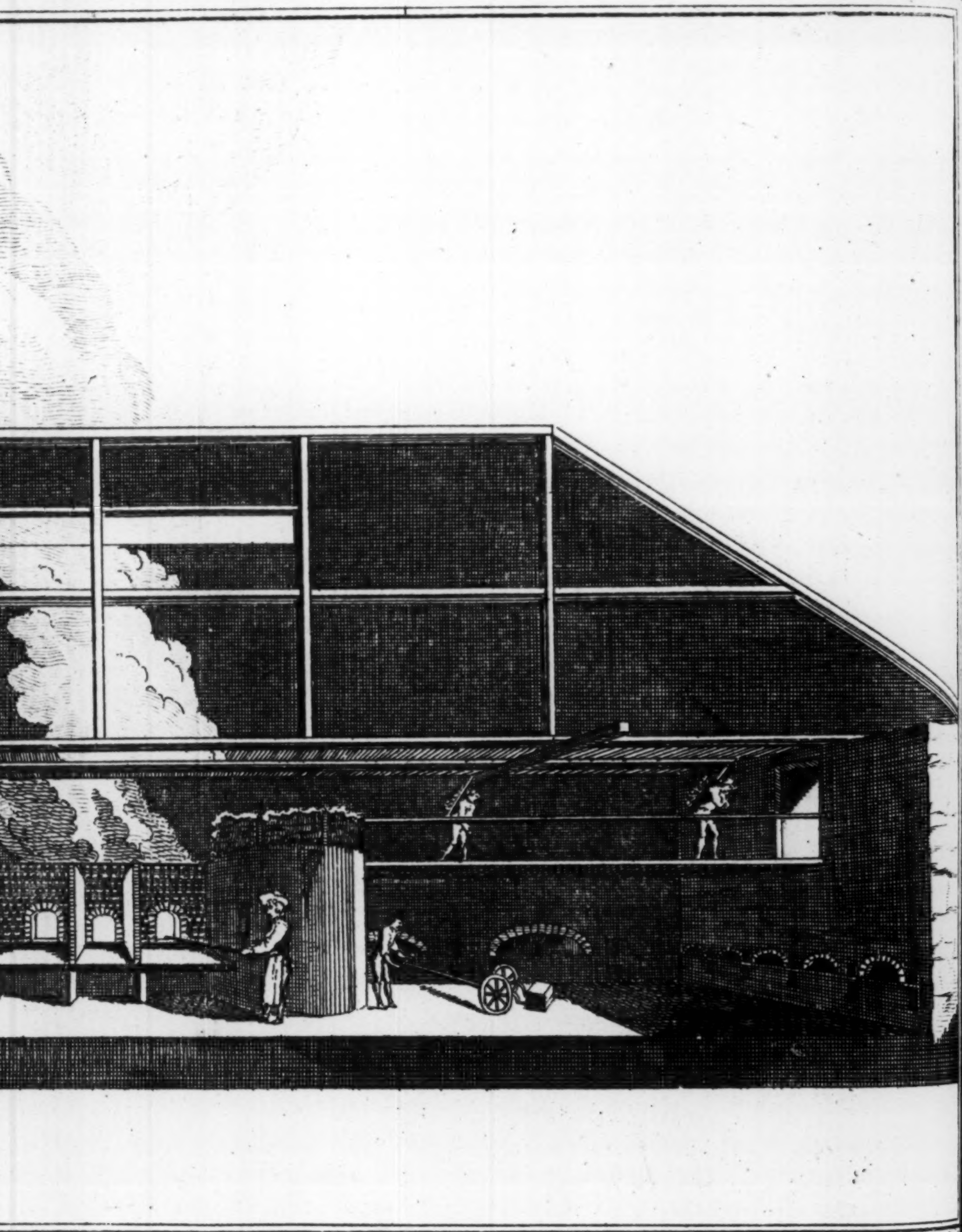

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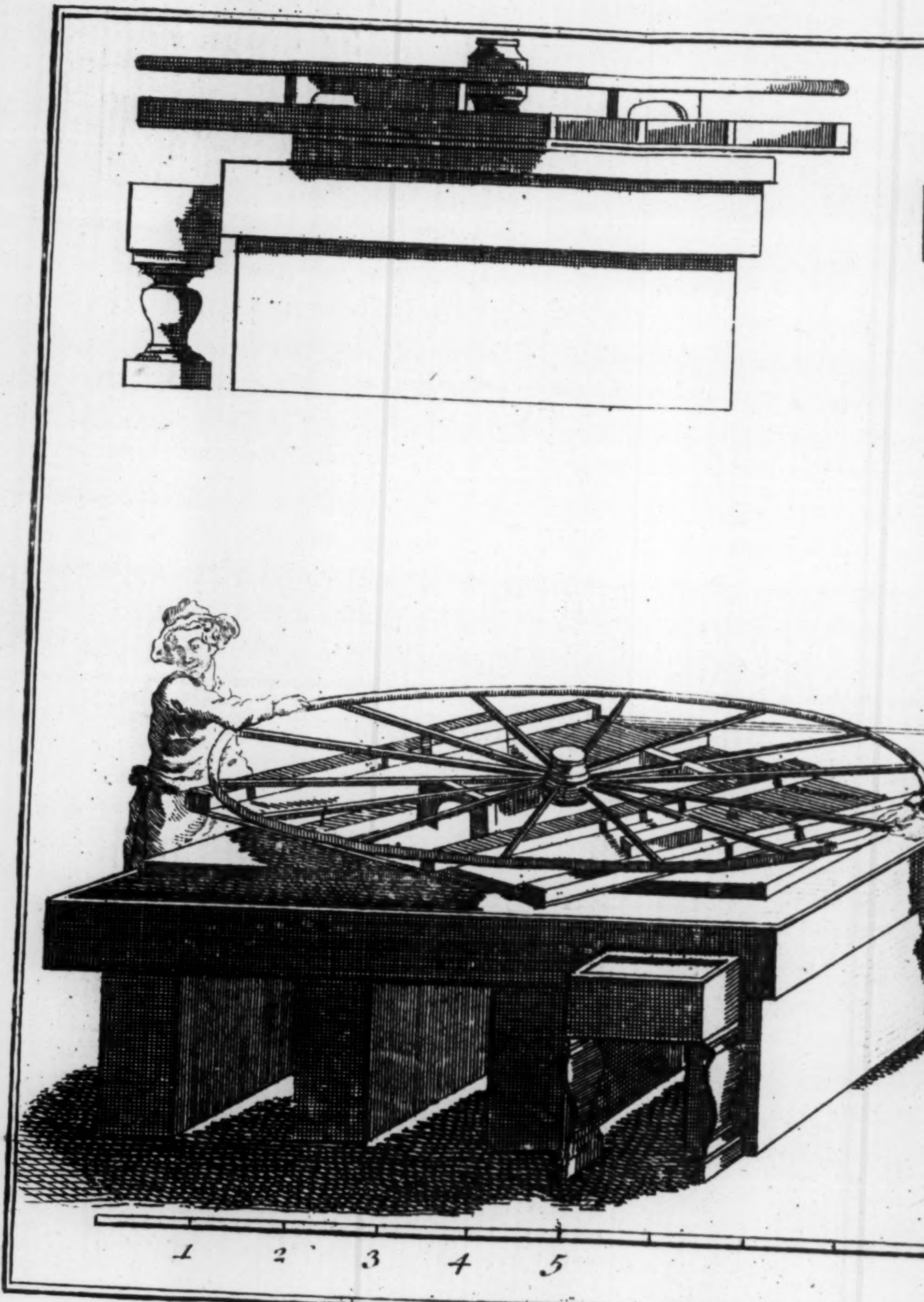

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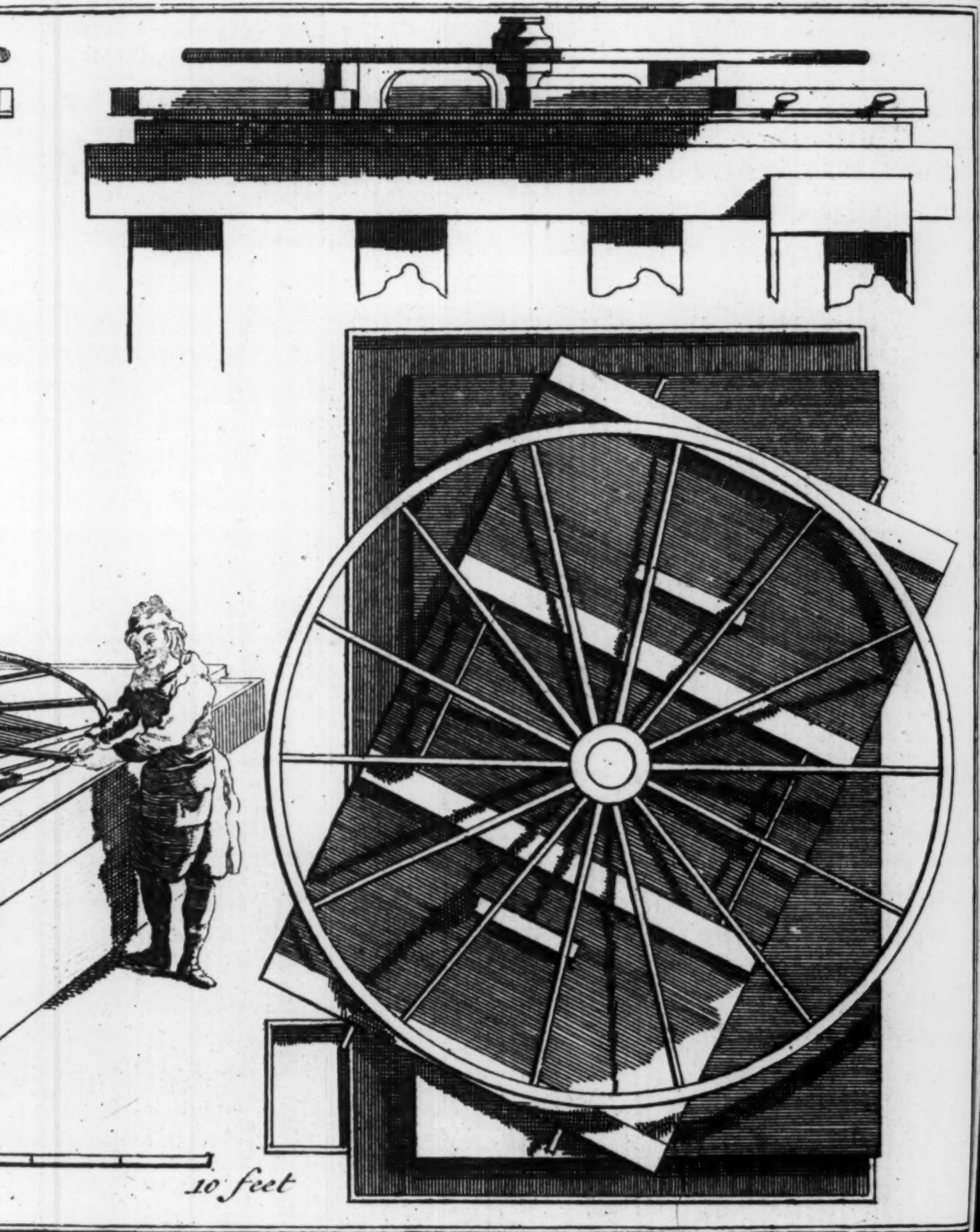

Toms ſcul

olishing of Glaſses.

Manner of the *Venetian* Manufactures; and that the largeſt Plates of Glaſs, run upon a Table of Metal, are worked, as well as the common ones, though in different Apartments, at the Caſtle of St. *Gobin,* betwixt *Laon* and *La Fere* in *Picardy*. It is the only Place where this Undertaking, ſo many Times attempted elſewhere, ever could ſucceed and be maintained *.

The Directors of theſe Manufactures prudently reſerve, for our Nation and themſelves, the Knowledge of certain Apparatus's, but chiefly of the Care to be taken in the Structure of the Oven, or Furnace. When the Intereſt of others is concerned, either in Matters of Commerce, or other Affairs in Society, a good Citizen never preſumes to be wiſer than he is deſired to be; I ſhall then be contented here with giving you, by Means of a Figure, an Account of the Particulars which theſe Gentlemen never refuſe to give ſuch Strangers as go to ſee their Manufacture. And I ſhall for the ſame Reaſon avoid mentioning what I have been able to learn concerning the Nature of the Stones which are to make the Foundation of the Furnace; as well as concerning the Mixture and Preparing of Matters, and the exact Proportion of the Inſtruments.

Theſe Glaſſes, after they have been run upon a flat Table of Braſs, and flattened under the Weight of a Cylinder of the ſame Metal, and then knealed (baked a ſecond Time) in another Furnace, called in *French Carcaiſſe*, go to *Paris*, to have the finiſhing Stroke put to them, whither they are ſent as yet rough, to ſpare the Coſts of the Poliſh, in Caſe they ſhould be broken in the Way. There they ſucceſſively paſs through the Work-houſes, where they are firſt roughed off, and then rendered perfectly ſmooth. In the firſt of theſe Work houſes, the largeſt Glaſs is previouſly laid horizontally upon a very hard fine grained free Stone, where it is faſtened with Plaiſter, ſo as to be perfectly immoveable. The Roughneſs of it is gradually ſmoothed with repeated Frictions, by Means of a leſs Glaſs that ſlides upon it. This Glaſs is faſtened on a wooden Table perfectly level. They, at firſt, load it with

The Rough-grinding of Glaſs.

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* Our Author ſeems here not to have heard of our Manufacture of Plate-glaſs at Vaux-Hall.

Weight more or leſs, and then with a Wheel well faſtened to it by the Weight. This Wheel ſerves only as a Hold for the Workman, to make the upper Glaſs go every Way backwards and forwards upon the immoveable inferior one.

The leſs Glaſſes are likewiſe poliſhed one upon another, on both Sides ſucceſſively, as the largeſt are. But the Wheel is needleſs to handle the ſmall moving Upper-glaſs. They replace it with four Wooden-handles faſtened at the four Corners of the Stone which the upper Table is loaded with. The rough grinding of both the larger and ſmaller Glaſſes is forwarded and completed by Means of the Water and Sand which is poured between the two Glaſſes. They begin with uſing a Kind of Sand, which is coarſe enough; and have it gradually finer and finer, as the Work goes on.

The Poliſh of Glaſs.

From this Work-houſe, the Glaſſes are convey'd to the Poliſhing-room, where the leaſt Unevenneſs that may ſtill be in them are made to vaniſh. In order to bring them to this Degree of Perfection, which is alſo called the Luſtre, they uſe the Stone called Tripoly, or that called Emeril, both finely pulverized. The Inſtrument for this Work is a Board garniſhed with a Piece of Felt, and traverſed by a ſmall Roller, both Ends of which are a double Handle, to make it move backward and forwards, and every Way. The Workman keeps it fixt to the End of a large wooden Arch that has a Spring in it, and which facilitates by its Spring the Action of the Man's Arm, by conſtantly bringing this moveable Board back to the ſame Point.

The Glaſſes are then fit either for Coaches, or Windows in the Temple or in the Palace; where they are guarded with Braſs-wire againſt the Injuries of the Hail and the Air without. Thoſe intended for Sconces and Looking-glaſſes are tinned.

The Tinning of Looking-glaſſes.

By what Secret or Magic ſhall theſe Workmen fetch, out of a Lamina made of Sands looſely collected together, thoſe large and magnificent Pictures which all Nations are inchanted with, and which make upon the Eyes

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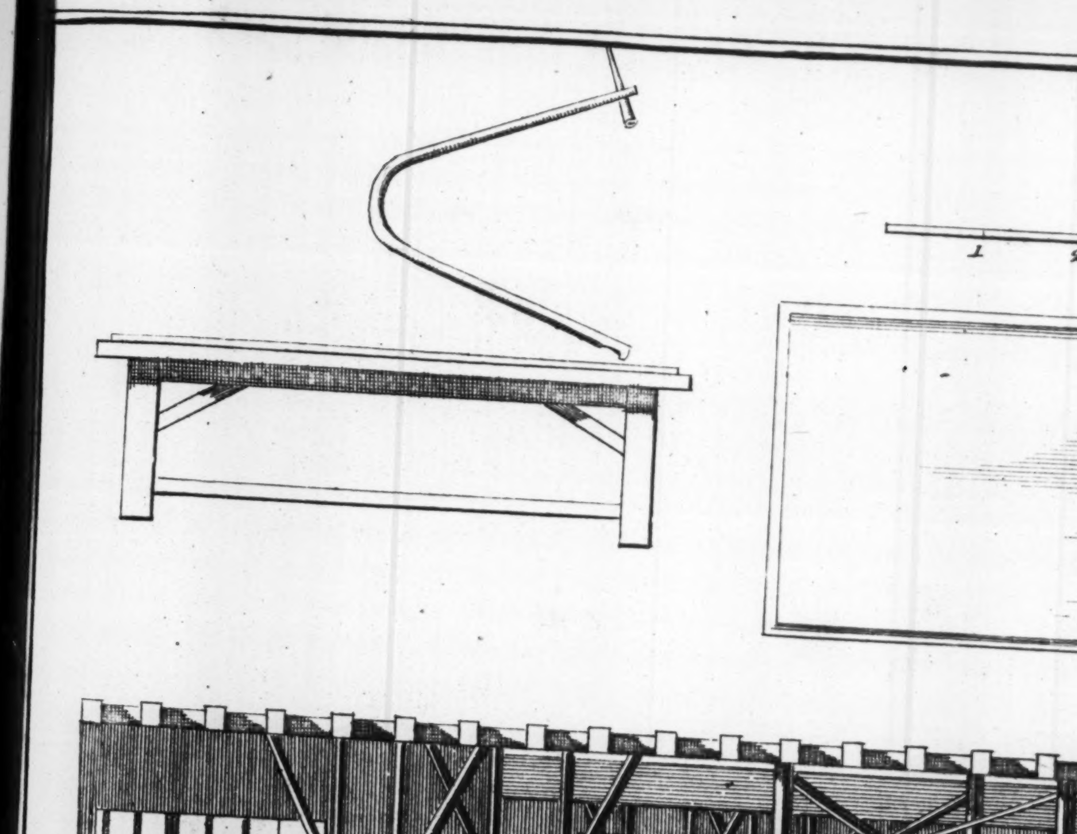

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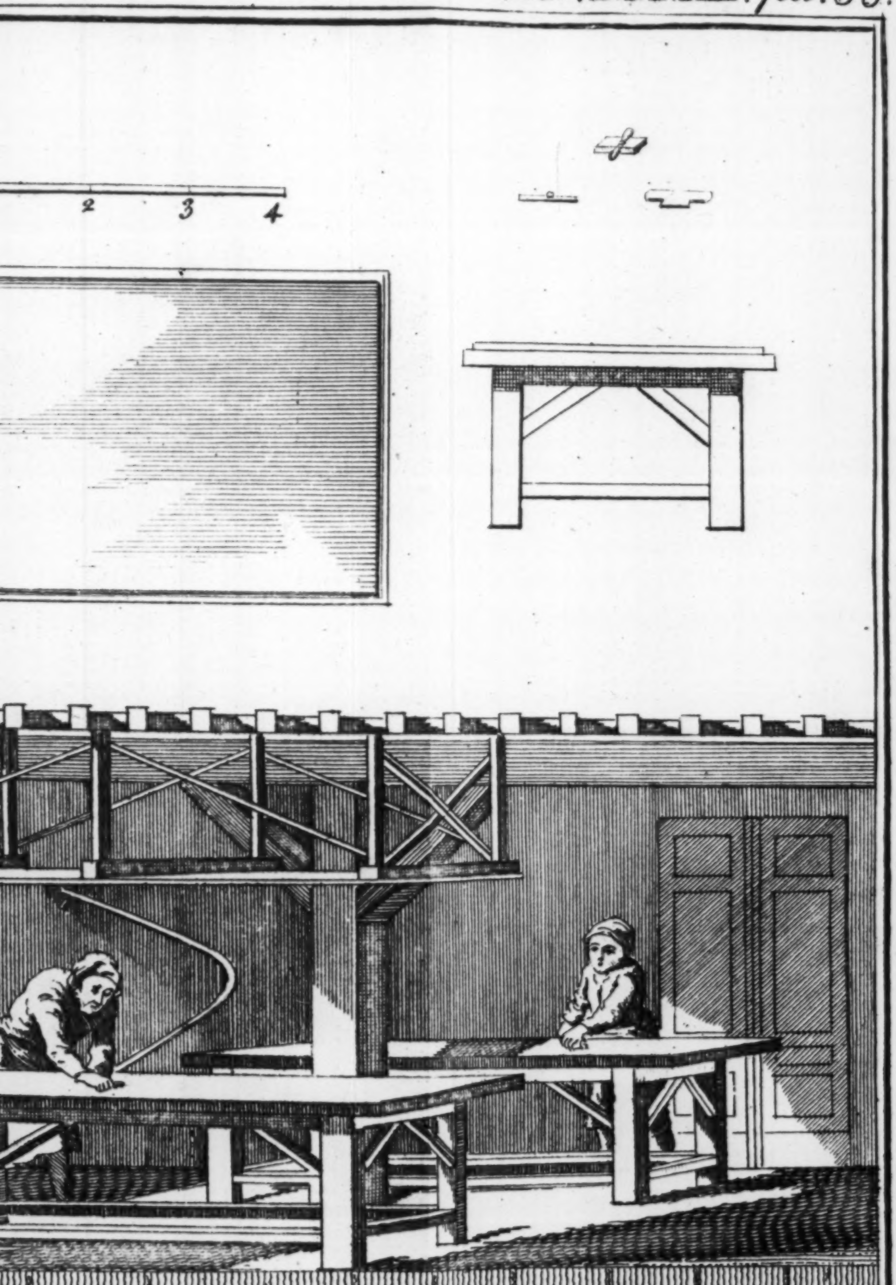

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of the moſt ignorant ſuch Impreſſions as are denied to the nobleſt Strokes of our greateſt Painters.

This Wonder, which racked the Brains of many a Philoſopher, is, on the Part of the Workmen, no more than a little Tin and Quickſilver, neatly applied to one of the Surfaces of the Glaſs.

The Tin-leaf or Foil, after it has been well beaten and rolled up, is unfolded and laid flat upon a fine ſmooth free Stone larger than itſelf. They ſpread it with a very ſmooth Ruler, rounded on the Side, with which it preſſes upon the Tin. This Ruler may be of Glaſs, or of any other hard Matter, and ſerves to hinder the Tin from ſhrinking, or being dented. They brighten the Leaf, and render it more gloſſy, or porous, by touching it all over with a ſmall padded Cuſhion, dipped in Quickſilver; and then the whole Leaf is intirely bathed with the ſame Fluid. They paſte a Band of Paper on the lower Edge of the Tin; and, by Means of a Couple of long Bars, mortiſed on the ſame Border into the Wooden-Frame that ſupports the Stone, the Leaf is ſpread upon, they ſuſtain and preſent the Glaſs, ſliding horizontally upon the Lay of Tin and Quick-ſilver. The ſuperfluous Part of this fluid Metal, that is, that Part of it, which could not be admitted into the minute Pores of the Tin, is driven both upwards and laterally by the Glaſs, as it comes forward. This ſmall Flood which overflows the Glaſs from brink to brink, and is puſhed on by it, runs on all Parts into a Groove, cut in the Thickneſs of the Frame, raiſed two Inches higher than the Glaſs. A Piece of Wood rounded on its inferior Side, and laid croſs-wiſe under the Frame, holds the ſaid Frame, the Stone, and the Glaſs in Equilibrio. The Workman may either keep the Stone level upon the Wood that ſupports it, or make it move backward or forward, in the Manner of a Sweep. If they incline it a few Inches forwards, all the Drops of Quickſilver, to which the Band of folded Paper refuſed all Paſſage downwards, and which ran into the Groove on the three Sides of the Frame, falls gradually one after another through the Extremities of the two Grooves, into wooden Bowls, placed on both Sides purpoſely to receive them.

What happens to a Couple of flat well poliſhed Pieces of Marble, when no Air has been ſuffered to get between them, happens to the Glaſs made to ſlide upon the Tin-leaf; and is a Conſequence of the Proceſs itſelf, which prevents the Inſinuation of the Air between the Surface of the Tin and that of the Glaſs. There is no Spring, nor any Action left to diſunite them, or equipoiſe the Preſſure of the external Air. This acts without the leaſt Reſiſtance on the outward Surface of the Tin and the outward Surface of the Glaſs. The two inward Surfaces muſt needs then adhere one to another, in Proportion to their Smoothneſs, and conſtitute but one Totality. This, perhaps, is the Principle of the Tenacity of viſcous Matters; it is, perhaps, all we ought to underſtand by the Action which they attribute to the Glaſs of *ſtrongly laying hold of its Tin**.

We are daily ſupplied from our Glaſs-houſes with new Ornaments, or ſerviceable Inſtruments. I ſhall not mention to you our Sconces, nor the Supports of our Deſerts: You will infallibly ſet a much greater Value upon the Conveniency of thoſe ſmall Table-ciſterns, into which every Body dips his Glaſs, in order to enjoy an unſuſpected Cleanlineſs, without the leaſt Dependance, Controul, or Ceremony. I imagine, you are no leſs pleaſed with thoſe Chryſtal-veſſels, which being opened at Top only, let out the Smoke of Wax-candles, without ſuffering them to be agitated by the Air, and which caſt no Shade upon the Table, having no opaque Branches. It is the ſame with blown Cryſtal-lamps, the Opening of which is elegantly crowned at Top, or has a Cover bored through and inclined, in order to reflect the Light; the inferior Opening of them being ſtopt by a moveable Bottom of a Lamp, to receive the Candle, or the Oil-veſſel to be put into them.

The Directors of theſe Manufactures have been no leſs deſirous and careful to oblige the Sciences, than they have been to decorate our Table and Apartments. Chemiſtry has received innumerable Helps from them: And Glaſs-houſes have aſſiſted and been acceſſory to the fineſt Diſcoveries in experimental Phyſics, by the ſeveral Lengths, gradual Increaſes, Forms and Proportions, which they have the Skill to manage and procure in all Glaſs-inſtruments, at the Pleaſure and Will of Naturaliſts.

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* This Action of the Glaſs is called, in French, bien happer l' etain.

However valuable our Glaſs-houſes may be by theſe bright and uſeful Productions, we may boldly affirm, that they are much more ſo by the moſt ordinary Window-glaſs, and by the Works commonly in uſe amongſt us. It was becauſe the Benefit of theſe Commodities was certain, and kept amongſt us the Money that was before ſent to foreign Countries, in Exchange for Veſſels of Metal, and other numberleſs Pieces of Goods, that our Kings have, ſeveral Centuries ago, granted the excluſive Privileges of Working theſe Manufactures to Families and Men of noble Extraction. Theſe Families, inſtead of being decayed like a great many others, and come to nothing for want of Support, and by the Diviſion of a middling Fortune into many Portions, are ſtill upon a very honourable Footing, by Means of the Grant beſtowed. A Crowd of young Gentlemen, after they have by their military Service acquitted their Obligations to both their Country and Birth, on their Return quietly enjoy the Liberalities of our Kings. They improve their Glaſs-houſes, as other Gentlemen improve a Stud of Horſes or a Vineyard: And, by ſcorning to remain idle after having ſerved their Country, they evidence the Nobleneſs of their Sentiments.

PLATE XI.

The Work of Run-Glaſſes.

We have ſuppreſſed in this Plate the Multitude of Workmen, even the moſt neceſſary, not to occaſion any Confuſion in ſo ſmall a Compaſs. The Memorandum concerning run and blown Glaſſes, which is at the End of this Volume, will ſufficiently intimate to the Reader the Things we have put in the Figure, and what other may be wanting in it.

PLATE XII.

The Rough-grinding of Glaſſes.

PLATE XIII.

The Poliſhing of Glaſſes.

The Sequel of the INSTRUCTIVE ARTS *and* PROFESSIONS.

DIALOGUE XVIII.

THE Inſtructions we ſtand in need of are not ſolely confined to the Knowledge of the Things which are about us; we alſo need being informed of a great many which are remote from us, ſome by the Diſtance of Place, others by the Intervals of Time. It is chiefly neceſſary for us to take Notice of certain Objects, which cannot affect our Senſes, as they are merely intellectual; but which ſerve at the ſame Time to rule the Minds, and have of Courſe an Influence over the Bulk of Society. Such is the Meaſure of Time: Such are the Laws: and ſuch the Knowledge of paſt Events. The Promiſes made to Mankind, and our future Hopes are of the ſame Claſs. If the Actions and Diſcourſe of thoſe who have lived before us, or are actually living at a great Diſtance from us, could affect any of our Senſes, we ſhould ſtand in no need of any Tokens or Signs agreed upon to perpetuate the Memory or communicate the Knowledge of them to others. What Method was then uſed by Society, which cannot ſubſiſt without theſe Things, although it can never find them in Reaſon any more than in our Senſes? Why, men made uſe of their Reaſon, and all their Senſes, to be informed of all intellectual Objects, by convenient Artifices. They now communicate the Knowledge of every Thing, even of what can never be ſeen, to each other; by the Inſtitution of ſeveral tranſitory, or permanent Signs, by which they correſpond with the Abſent, and even with the Dead. God did not think it proper to abandon the Determination of ſalutary Truths to the Uncertainty of our Reaſonings: But he informs us of them by the joint Aſſiſtance of the Monuments of Hiſtory, and by a Miſſion which is perpetuated from one Age to another. So that, wherever

ever Reaſon is no longer our Guide, we are ſure of being aſſiſted by external Signs.

When a certain Set of Philoſophers, who are no great Friends to Hiſtory, becauſe they are ſtill leſs ſo to Revelation, ſpeak to us of Man and the Invention of Arts; they tell us, as a rare Diſcovery, that the Cries, by which Animals of the ſame Species inform one another, was a Hint to Man that he perhaps, as well as they, might gain ſignificative Sounds: That the Singing of the Nightingale had been the Occaſion of Man's trying his own Pipe, and of the Invention of Muſic: That Man was taught by the Swallow the Arts of Maſonry and Houſe-building. That he had the Art of Weaving from the Spider. That a certain Species of Caterpillars had, by covering themſelves with their Pods, given him the Notion of artificial Garments: That he had conceived the firſt Notion of the Art of Dying, on ſeeing a Dog with his Mouth ſtained red, by eating one of thoſe Animals called the *Purple-fiſh**; in ſhort, that all Animals had been his Teachers by Turns.

If you would liſten to the Authors of thoſe wonderful Anecdotes, Man ought to be looked upon as a Kind of Brute; whoſe diſtinguiſhing Character is the mimicking of every thing ſhewed him. He would, according to them, be no more than a big kind of Monkey, without any Deſtination or Prerogative, who, by mimicking all the Ways and Proceedings of other Animals ſhould have collected by Degrees the ſeveral Pieces which conſtitute what is called human Reaſon. But does this pretended Baboon, who thus ſtrives to ſhake off the Reſtraint he is kept under by Revelation; does he, I ſay, ſhew the ſame Unconcern for the Scrip of Parchment that ſecures him eight or ten thouſand Pounds a year? Do we ever ſee him endeavour to throw a Veil of Uncertainty over the Nobility which his Anceſtors have tranſmitted to him with their Titles? Beſides, this unlucky Ape is not the only Animal on Earth that makes Imitation his Delight. There are Species of Monkies of different Shapes. There are very numerous Tribes and Families of them in *Cafreria* and *Zanguebar*, who generally copy what is done before their Eyes; Nevertheleſs, none of theſe Apes, either of the ſmall or large Kind, ever took it into his Head, that we know of, to learn of our Travellers how to carry on Commerce, or at leaſt how to ſpeak. It muſt then be confeſſed, that Irreligion tells us Stories full of Abſurdity: Or, if it pretends to make us prefer its Hiſtory of the human Mind to that of Monuments and the holy Scripture; we may, at that Rate, entertain ſome Hopes of ſeeing, very ſoon, the *African* Monkies flocking among us, and introducing Colonies of their own, as orderly, and as well governed, as thoſe of our *European* Baboons, whom they have ſeen ſettling themſelves on the *Tooth coaſt*, and the *Cape of Good Hope*.

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* Murex.

We muſt then have Recourſe to Monuments and Hiſtory; to the Inſtructions of Experience and Revelation: By Means of which, we ſhall ſoon arrive at the only Origin and true End of the fineſt Arts.

Experience teaches us, that Man is not indebted to Animals for Advices or Inſtructions of any Kind. He has received from his Maker a Capacity which out-does them all; becauſe he was appointed to preſide over them. And he, indeed, buſies himſelf moſt ſeriouſly with very ſublime Objects, which Animals ſeem not to have the leaſt Suſpicion of; becauſe their Deſtination is far different from his. Thus buſies he himſelf with Thoughts of the ſupreme Being, of his own Obligations, and of paſt and future Events. All theſe Objects, and a great many others are inviſible. But although they can affect neither his Eyes, nor any of his other Senſes, they make the ſtrongeſt impreſſions upon his Underſtanding; and the indiſpenſable Neceſſity he is under of being well appriſed of them, cauſed him to invent, and afterwards to improve, a thouſand different Ways, the ſeveral Signs, by Means of which he tranſmits what he knows of them, both to thoſe who are abſent, and thoſe who ſhall come after him.

The Origin of Names, Sirnames, and other Monuments.

From the Deſire of tranſmitting to others theſe uſeful Sciences, came thoſe Names and Sirnames, which are the Characteriſtics of Perſons, Places, and Events. The Names of the Patriarchs recall the Ground of their Hiſtory to our Minds: And I hope I ſhall one Day or other make you ſenſible, how the Signification of the ſingle Name of *Abraham* is the completeſt Proof of the Truth of the Revelations. To the ſame Original muſt be referred ſtanding Columns and Altars, deſigned to mark out the Places of religious Aſſemblies. Hence came the regular Inſtitution of the Feaſts which, from the very Beginning, were monthly and yearly celebrated, not only to give Praiſe to the Author of all Bleſſings, but alſo to acquaint Men of their ſeveral Duties, and the Order of their Works. Hence the poetical Language, or the Uſe of meaſured Words deſigned to be ſung on Holy-days, and repeated in Families. Hence the Symbols publickly expoſed to convey a general Notice among very numerous Societies at once. Hence Books and Inſcriptions; hence painted, carved, and engraved Images; hence ſepulchral Figures and Medals, Archives and Records; and generally all the Signs commemorative of paſt Events, and of Engagements contracted for Time to come. It is then plain from Experience, that the chief Purpoſe of the nobleſt Arts was only the Inſtruction of Society.

The holy Scripture ſpreads a new Light upon this. It enobles all our Wants, and all the Methods we uſe to ſupply them, by informing us that God is the Author of both. It was not his Will and Pleaſure, that the Things, which are of greateſt Concern to us, ſhould be perceptible in their own Nature, and immediately attainable by us. He kept them concealed, as it were, from the careleſs and indifferent; but he opened to the Lovers of Truth all the Avenues that could poſſibly lead them to it; and theſe are ſuch as not only lead to Truth the Man who ſearches after it, but even remind him of inquiring into it when he is neglected in that Point.

The Original and End of Aſtronomy.

God, from the Beginning, informed *Adam* of the Deſtination of the Luminaries he had juſt placed in the Heavens, and of that of their ſucceſſive Returns to the ſame Points. Man reads no Inſtructions in the Heavens concerning his Duties, nor with Relation to the Order of his Works and Operation; but he ſees in them the Signs of the Holy days appointed to inſtruct him of all theſe Things. His Inſtruction is then the true End of the Sight of the Heavens, and of the Study of Aſtronomy.

In the Beginning God inveſted Man with the Poſſeſſion of the Demeſne he had aſſigned him, by bringing all the Animals before him. They all appeared in Silence before the Eyes of their Maſter. Man alone ſpoke. He gave each of them a Name, and thus knew all his Domeſtics one by one. The firſt uſe he made of Speech, which diſtinguiſhes him ſo eminently, what is it more than the bare Sign of his Knowledge, or a Means of informing his like of what is unknown to him, and an Inſtrument for converſing about what is actually remote from, or without the Reach of the Senſes of either?

The Diviſion, which God introduced afterwards into the Speech of Men, ſerved at that Time, as it ſtill does, to retain in every Part of the Globe a Knot of Inhabitants, ſtrictly united by the Facility of mutually underſtanding and aſſiſting one another. When we ſtudy the Language of the *Greeks* and *Romans*, or that of Nations now living, we likewiſe intend thereby to get a Share of their Knowledge, in order to ſhare it ourſelves with others. Therefore the Study of Languages is a Means of being inſtructed.

The Aim of the Art of Writing.

As Speech is the Sign of our Thoughts, ſo is Writing the Sign of our Speech: Whence it follows, that the principal and chief End of the one is, as well as that the other, Inſtruction in general.

It is the ſame with Muſic and Painting, which are ſo highly ranked among the nobleſt Arts. Muſic is a Kind of Speech, and Painting a Kind of Writing. When they pleaſe both the Eye and Ear, they do it in order to give Efficacy to their Inſtructions by the Ornaments with which they ſet them off: But whenever they aim at pleaſing without conveying any Inſtruction; do not they from that Moment begin to degenerate? Do they not miſs the End they aim at by their Inſtructiveneſs? This, indeed, is a fine Queſtion; and the only Point of theſe extenſive Arts we ſhall here diſcourſe upon; leaving to the greateſt Maſters the Care of teaching the Grounds and practical Parts of them.

Every Body is allowed to have ſome Reliſh for them: And as a Man can, without being a Poet, be ſenſible of the Difference between *Virgil* who copies Nature, and *Lucan* who makes a Shew of Wit; ſo can he, likewiſe, without being a Muſician, feel the true Beauties of Muſic, and judge rightly of the Merit of profeſſed Muſicians. But, if we attribute Miſtakes to any of them, or venture to give the Preference to one before another, let us take Care not to do it otherwiſe than by Means of ſome glaring Principle admitted by Muſicians themſelves, and that may decide the exact and real Value of their Methods. We may either build this Principle upon the Pretenſions of the greateſt Maſters, or derive it from the Notions univerſally eſpouſed, and chiefly from the Wants of Society. The Deciſion of our great Maſters ſeems little fit to ſupply us with the general Rule we are looking for. They are too much divided in their Opinions. The *Italians* and the *French* are thoſe who ſeem beſt intitled to be liſtened to, on Account of their Progreſs in this Kind. But, jealous as they are of their reſpective Talents, they have no apparent Diſpoſition to profit by the Science of each other.

This Quarrel, I own, is now very different from what it formerly was. The two Nations have, as it were, drawn nearer to each other than they were before. The *French*, though Friends to Song, have long put more Fire and introduced more Harmony into their Compoſitions, than they did in the laſt Age. The *Italian* Muſic, though full of Diviſions and ſcientific, yet becomes daily more eaſy and more cantabile. We *French* no longer admire our Muſic, in Preference to any other. We have ſhaken off that Weakneſs which diſgraced and kept us within very narrow bounds. We think that a *Frenchman* may be a very good Muſician; but we very gratefully accept of what good Muſic is ſent us from ingenious *Italy*. Nor are we ignorant, that the Sublime of every Kind did frequently come to us from beyond the *Alps*. This Reconciliation, if it could be brought about, might lead us to the Principle we are now in queſt of, had not a much more violent Conteſt ariſen between our greateſt Compoſers. Our ſubaltern Performers, and Lovers of Muſic have intruded into the Cauſe, and very often talk much louder than any of the beſt Maſters. The Swiftneſs, with which one of the two Parties has crept into the Favour of the Public, has introduced among us a Kind of Muſic perfectly new. According to ſome, we are arrived at laſt at the higheſt Degree of Perfection, and have found the Standard-rule of the Sublime; whilſt others affirm, that we are ſtill remoter from it than before.

Mr *Rameau*, after having deeply ſtudied both Harmony and the Means of bringing it to Perfection, has carried that Part of Muſic to a Degree of Boldneſs, in Point of compoſing and Readineſs of Execution, which the *Italians* themſelves ſeem not as yet to have brought it to. The Applauſe, generally and deſervedly beſtowed on the Learning of this celebrated Man, has made many jealous of him, has raiſed a Crowd of Imitators, and conſequently a great many bad Mimics.

On the other Side, Meſſ. *de La Lande*, *Mouret*, *De Bouſſet*, *Couprin*, *D'Agincourt*, *Le Clerc*, and other Maſters of the higheſt Reputation, many of whom are ſtill alive, have always been of Opinion, that the firſt Merit of Muſic was a beautiful Melody; becauſe it is the Melody that conſtitutes the Judgment and Character of a Piece of Muſic: But that Melody was either inconſiſtent, or not diſtinguiſhable with an exceſſive Rapidity, no more than with a Luxuriancy of Harmony and Flouriſhes: That, therefore, the Beauty of the Melody being drowned, as it were, in the Multiplicity of our modern Diviſions, or totally baniſhed from the new Muſic, it was no longer the Muſic of Reaſon: That the Diſregard for Melody was carried now ſo far as to pitch indifferently upon that which had the leaſt Conformity with the Nature of the Subject: But that it was the ſtrangeſt of Miſtakes to imagine, that much Fire and Harmony are ſufficient to render a Piece of Muſic compleatly beautiful, let the Harmony be what it will. That they had as lief ſet four Parts to the Air of *Nicholas Gardien**, or ſing an Invocation to Peace, in a Grand Concert upon the Tune of the *Nais de Solcgne*†. What they add to this is ſtill more important. They ſay, that as we are all of us born more or leſs Geometers, or Friends to Symmetry and Proportion, we are likewiſe more or leſs Muſicians by Nature: That the firſt Step of our Muſic, and that of all the Nations who have cultivated their Talents, was the producing of Melody: That the ſecond Step conſiſted in ſetting off and giving a Subſtance to that Melody, by agreeable Concords: That conſequently Harmony is but a Beauty of the ſecond Rank, and neceſſarily ſubordinate to the firſt: That it is a Waiting-maid, whoſe Duty it is to help, dreſs out, and ſet off her Miſtreſs; but not to hide, much leſs to diſgrace her Charms. All our greateſt Melodiſts unanimouſly acknowledge the rare Talents of Mr. *Rameau*, in Point of Harmony: But they ſay, that a Novelty and an extraordinary Method of Proceeding, that meets with good Succeſs in the Hands of a great Genius, very often cauſes us to be over-run with a World of bad Mimics, and may ſuddenly introduce a ridiculous Method, or a Way full of Affectation. That it is with the Diſorders of Muſic, as it is with thoſe of the *Bel Eſpirit*: That the one and the other are the two Diſtempers of our Age, cauſed both of them by the Contagion of Example. That the Briſkneſs and Life of this rapid Muſic has filled with Emulation the Majority of our Compoſers, who now think themſelves ſo many Eagles, in Proportion to the Swiftneſs of their Flight, and the Difficulty we find in following them; whence came the new Muſic, that difficult Muſic, which they themſelves call DIABOLICAL; but, that all theſe new coined Flights (though they ſhould always run with four Parts, and *crackle* like a Torrent of Sparkles) are nevertheleſs (when Melody is wanting in them) a downright *ignis fatuus*, a Phantom of Muſic, and a Heap of harmonious Trifles. Melody, they again ſay, is to the Subject in Hand, what the Garment is to the Body you intend to deck; and Harmony is to *Singing* or *Melody*, what the Lining and Ornaments are to a Suit of Clothes. Ornaments may ſet off the Cut and Goût of a fine Habit, if they are put on it with Diſcernment; whereas they will eclipſe it, if you are too laviſh in them. Four muſical Parts, all of them full of Diviſions, Fire, and Rapidity, but void of Melody, are like four Rows of *Fanſioles* (a) patched up together and clapt upon a Lady's Sack. Fine Clothes, no more than fine Muſic, can ever reſult from ſo many ill ſorted Things. Such is the Quarrel among the firſt Maſters.

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* A Burleſque French Song.

† A fine Piece of Muſic for the Harpſicord, but all in the gay Strain.

(a) A kind of Trimmings now in Faſhion.

There is the ſame Diviſion among thoſe who are at the Head of our fineſt Concerts. M. *Guignon*, who is perſuaded that Muſic was deſigned to fetch a Man out of Lowneſs of Spirits, has choſen that Method of Muſic which was fitteſt to rouze, amuſe, and ſurpriſe him. The Performance of this ingenious Artiſt is of the utmoſt Agility; and he pretends that the Swiftneſs of his Bow is doubly ſerviceable to the Public, as it rouzes their Spirits by its Fire, and is fit, by its laborious Performance, to form a Set of inſtrumental Muſicians Proof againſt any Difficulties. He could not, I think, authorize his Conduct upon any more noble, and more ſatisfactory Motives.

Mr. *Baptiſte** on the contrary, does not approve of this Ambition, of being for ever conquering muſical Difficulties: Or, if he thinks it fit for any Thing, he is very far from looking upon it as the Way to Perfection. This Affectation of hunting after hard Work is, in his Opinion, labouring to get a few rough Pearls from the Bottom of the Sea; whilſt Diamonds are to be found on the Surface of the Earth. A prodigious Difficulty in the Performance of a Piece appears to him no Preſumption in Favour of it; and nothing but what is ſure of pleaſing any Audience can have the firſt Rank in his Eſteem. I ſtrive, ſays he, very often to produce, not indeed what will make the Muſician ſweat, and put him out of Breath, nor what will beguile an Audience by much Agility, or ſtun them by a thundering hurly burly Noiſe; but ſuch Strokes as never fail to raviſh and ſtir them up. *Baptiſte* applies to his Muſic what has been ſaid of Poetry, (a) that cauſing a Surprize to a few Lovers of the Art, by ſparkling Flights, is but a trifling Merit: But that the Sublime conſiſts in pleaſing the Multitude, by a Variety of ſoft Motions. In order to this, he will have the inſtrumental Sound to be ſmooth and full, rich, and big with Paſſion, continual, and ſavouring of a tuneful Voice, of which it is both the Imitation and Support. But whenever he is in a Concert where Muſic is ſhivered, minced, and pulverized after the modern Faſhion, away he runs as though it were from a Shower of Hail Shot, a Hurricane, a Caterwauling, or a mock Concert of Kettles and Frying-pans. I may here quote the Expreſſions of his Diſdain, without pretending to eſpouſe them. He never inquires of what Nation, or from what Hands a Piece of Muſic came. Whether it is *German*, *Italian*, or *Engliſh*, is all one to him. If he but finds it elegant and delicate, he plays it directly, and ſoon makes it his own, by the Juſtneſs of his Sounds, and the ſingular Energy of his expreſſive Strokes. But he obſtinately refuſes his Hands to what has no other Merit, but that of being out of the Way, and full of fantaſtical Oddities. The Freedom and Steadineſs of his Choice, in this Reſpect, have often brought upon him the Reproach of being an unconquerable, obſtinate, whimſical Man, or an ignorant Muſician, who was afraid of Difficulties. He underwent a kind of Perſecution, and wilfully exiled himſelf, before he had obtained the honourable Retreat he now enjoys at the Court of the King of *Poland*. He was more than once deſired to conſider by way of Comfort, that his diſtinguiſhing excluſive Talent conſiſted in the producing of energic Melody, in that Fulneſs of Signification, which is the moſt affecting Part of both Muſic and Painting; and that the mellow Sounds, which he fetched out of his Violin, were the moſt exquiſite and ſublime that ever could ſtrike the human Ear. But he once thought himſelf fully made Amends for his paſt Grievances, by a Judgment which appeared to him ſtill more honourable: He is ſingularly fond of *Corelli*'s Pieces, and has ſo nicely imbibed the Spirit of them, that, as he was playing them one Day before *Corelli* himſelf, that great Muſician embraced him tenderly, and made him a Preſent of his Bow.

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* A famous Compoſer, and an excellent Performer on the Violin.

(a) Non ſatis eſt pulchra eſſe poemata: dulcia ſunto:
Et quocunque volent animum Auditoris agunto.
Horat. in Art. Poet.

It is a difficult Point to fix upon a Rule in this Variety of Sentiments between Maſters. Another Genius among them ſtill increaſes my Perplexity. More fruitful even than *Baptiſte*; he is quick as *Guignon*, as harmonious as *Rameau*, as melodious as *Mouret*, as ſoft as *Lully*; he, in ſhort, turns his Genius as he pleaſes, and as you pleaſe. Melody, Harmony, ſolemn Muſic, moving Sounds, Rapidity, Flights; all, in ſhort, is equal to him: He is an excellent Man in every Kind. All Parties will have Mr *Mondonville* in their Minds. But, who can gueſs him and alledge his peculiar Taſte as an Authority? Shall we take the truly affecting Beauties of his Compoſition to be what he produces from his own Inclination and Diſcernment? Muſt we look upon the wanton gay Flights of his Performance as being what he, out of Complaiſance, grants to the Tyranny of the reigning Mode? Were it poſſible to expoſtulate with what we both value and admire, I could reproach this amiable Man with keeping among us an inteſtine Diviſion that grows warmer every Day, and muſt degenerate into a civil War at laſt. They will lay to his Charge the Miſchiefs he will not prevent.

Notwithſtanding the Heat of our Diſputes, and the Difficulty of aſſigning the Superiority of one Method over another; we may take a wiſe Reſolution, which is that of eſpouſing no Nation or School whatever; and of deriving the judicious Uſe of Muſic from the primitive Inſtitution of that noble Art, from the general Practice of all Nations, and in ſhort from the real Exigencies of Society.

Firſt, can we not ſay, that the Knowledge of the Inſtitution of Muſic implies in it the Knowledge of its Deſtination and true Nature? What Uſe Muſic may and ought to be applied to has not been a Secret till now. In the remoteſt Antiquity, we ſee Canticles conſtantly and ſtrictly united to religious Aſſemblies, to Treaties of Alliance between one Nation and another, and to the Celebration of great Events, and of thoſe Men who had done eminent Services to Mankind. Hence the Hymns, Odes and ſolemn Forms. They are found again in ſacred and prophane Writings, in the ancient Practice, and even in the Modern, from an Imitation of the foregoing Cuſtoms. They ſet to Muſic whatever was neceſſary to be remembered. The Tune made the Impreſſion of it deeper. Poetry prepared and facilitated the Singing of it by the nice Choice of the Words, by the Advantage of Metre, and the Beauty of the Similies. The Languages were conſiderably altered before the People abandoned theſe ancient Forms of Singing, which were as much reſpected as the ancient Monuments: And whenever the Meaning of the Figures or Canticles happened to be loſt, they were renewed, or explained without being ſuppreſſed.

Every one knows the Canticles of the ancient People of God, and the Occaſion of them. Among other Nations, even the moſt ſuperſtitious and moſt barbarous Melody was, from a mere Effect of the primitive Inſtitution, ſtill made Uſe of to invoke the Almighty; to perpetuate the Tenor of an Alliance or Law, and mutually to fire one another with Virtue, by the Recital of the Actions of great Men. Public Inſtructions were always ſung. Singing ſerved to notify the Poſition of the Stars, and the Return of annual Feſtivals, and even ſometimes the Opinions of the Philoſophers. There were hardly any Inſtructions, but what were rendered more agreeable and eaſier to be remembered, by Means of Singing. The Holy Scripture, *Homer*, *Virgil*, *Livy*, and all the *Chori* of the ancient Tragedies, will be my Vouchers for this Fact. Among the *Latins*, whoſe Monuments are not by a great deal ſo antient as thoſe of the Eaſtern Nations, the ſame Word which ſignifies *to ſing* (a), is alſo commonly employed to ſignify the making a Pact, a Covenant, or a Treaty of Peace, and binding one's ſelf by Promiſes either to God or Men. But, the Habit of ſinging the Praiſes of imaginary Gods, more enſlaved to ſhameful Paſſions than the moſt profligate of men, failed not to corrupt all Notions of Virtue whatever. Muſic and Painting have, ſince that Time, continued, and do ſtill continue, as they did from the Beginning, to teach, in a very ſtriking Manner, the Things they repreſent. No Inſtructions are better received. But as they (when out of our Temples, where they ſtill are uſed conformably to their firſt Inſtitution) moſt commonly teach us nothing but the Love and Practice of ſuch Pleaſures as are deſtructive of Juſtice, of good Order, of the Peace of the Mind, of the Health of each Particular, and of the true Happineſs of Society in general; their Inſtructions infallibly corrupt Men inſtead of rendering them better. Doubtleſs the Man, who ſings *Venus*, or any other equally irregular Deity, aims at being applauded and imitated. His Songs, far from conveying Inſtruction, never fail of poiſoning every Mind with their Contagion.

(a) Pangere.

All the Pleaſures we are ſuſceptible of have been created to a wiſe Purpoſe, and to invite us to obtain (under the Reſtraint of Rule) ſuch Bleſſings as may be profitable to every private Man, without hurting Society, whoſe Intereſts are as dear to him as his own. But, if your ſeparating the Good, or End, aimed at by the Creator, from the Pleaſure which is either the monitory, or the attractive Part of it, is an immediate Diſorder; offering us Pleaſures, merely for the Sake of themſelves, is ſubverting Order: Let us uſe a plainer Term; it is a Proſtitution.

What a world of Artiſts are condemned by that ſingle Word! If you ſet out with the Encomiums of Proſtitution, you may very well go on with that of the Pleaſures that do not lead us to the Intention of Nature and the Good of Society. Examine them all. There is not one but what was inſtituted to ſome excellent Purpoſe. Religion baniſhes none of them, but ſhe rules them all by never ſeparating them from their true End. Cupidity alone, or a falſe Philoſophy, will make a Divorce between them. Ye, Artiſts, who are at the Head of our Concerts; ye little know the Public, when you amuſe it with your own weak Side. You ſee Crowds of People flock together at the *Tuilleries*, when Mr. *Mendonville*'s *Venite exultemus* is advertiſed: And by-and-by you will invite us to hear you ſing ſome lewd Amours, or inſipid Metamorphoſes. This, indeed, is having too bad an Opinion of us. The Public is no Enemy to Virtue or Truth. Have the Courage only of being yourſelves virtuous and inſtructed; introduce more Dignity and nobler Views into your Concerts; and the Number of your Partiſans will be much greater.

The exquiſite Art of Muſic was firſt ſubverted by amuſing the Ear with empty Words, or by endeavouring to pleaſe without inſtructing it; or by inſtructing diſſolutely. Muſic, having once diſunited two Things which ought to have been ever inſeparable, *viz.* the Information of the Mind and the Pleaſure of the Ear, was eaſily drawn into another Miſtake, leſs however than the foregoing. I here point at the Cuſtom which has for ſome Ages already prodigiouſly taken in the World, of laying aſide vocal Muſic, ſolely to attempt the Amuſement of the Ear, without offering any Thought to the Mind; of trying, in ſhort, to ſatisfy Man by a long Train of Sounds utterly deſtitute of Signification.

Pleaſing without Inſtruction; the firſt Subverſion of the Uſe of Muſic.

Pleaſing with meer empty Sounds void of Signification, a ſecond Diſorder in Muſic.

Muſic had invented a Variety of Inſtruments, ſome of which were fit by well marked Strokes to rule the Steps of a March or Dance: Others were, by their Brilliancy, fit to expreſs, and even to convey the Joy of public Feaſts at Diſtances inacceſſible to the human Voice: Some, leſs apt to drown a Voice, proved fitter to ſupport it by Way of Accompanyment. They beſides ſerved ſucceſſively to eaſe it by Rittornels; to give it the Tone by going before it, and to make it pliant to any Melody, by frequent Repetitions.

The Succeſs of theſe different Means of pleaſing ſeduced the Muſician himſelf; and it being eaſier for him always to have at his Diſpoſal an obſequious Inſtrument than a fine Voice, he thought he could replace the human Voice by the Sound of Inſtruments which are only Images of it. The Illuſion was ſtill greater, after he had brought the Extent of Inſtrument, and the Agility and Flexibility of his Fingers ſo far as to perform in ſome Reſpects more than the fineſt Pipe could poſſibly do; he, at laſt, gave himſelf up entirely to the practiſing of Sounds, and for a great while preſumed to ſpeak to the Ear, without telling any Thing to the Mind. How was this miſtaking Man! A Melody void of Meaning will always be a Body without a Soul; the firſt Impreſſion of which may, indeed, pleaſe, but never ſupport itſelf. The Emotion of the firſt Stroke of a fine Bow can never be of long Duration.

Let us aſſign to this Miſtake of ſo many Muſicians its true Reaſon. Sound is the Object of the Ear, as Colour is the Object of the Eye. Fine Sounds are the Delight of the former, as fine Colours are of the latter. But, Colours being appointed to eſtabliſh a Diſtinction between Objects, they cannot pleaſe long, if they are not connected with ſome Figure or other: They are out of their Place in that Caſe. A fine marbled Paper, or a fine Furniture of *Iriſh*-ſtitch Tapeſtry Hangings, are beautiful Colours, and are nothing elſe. The firſt ſight of them is not unpleaſant: And they may hint to you ſome uſeful Shades and Combinations of well-matched Hues. But, if you would prolong this inanimated Scene, though you ſhould vary it for a Quarter of an Hour together, there would be no bearing of it. The Mind is not fond indeed of Colours, but of coloured Objects. The Sounds help us likewiſe to ſketch out a Multitude of Things and Thoughts. But if they drop in one after another, without being connected with any Object or Thought whatever, they tire us, we know not why. They naturally awake us, and fill up our Mind with the Idea of the Things they are the Signs of. They will mark out a Departure, a Motion, a Piece of News, a Solemnity, an Advice; and the Expreſſion of Joy, of Sadneſs, of Want, or any other Situation. But they begin to be tedious the Inſtant they ceaſe to ſignify. Bells and Trumpets rejoice us by their Publications: But when they have fully acquainted us with what we were to be told, we then long to be rid of their Noiſe. We alſo liſten with Pleaſure to a Prelude that prepares the Ear for the Song which is to follow, or to the intermediate Symphony which, at the ſame Time that it gives ſome Relief to the Voice, makes an agreeable Connexion between two Parts of the ſame Melody, which, otherwiſe, would be interrupted by a long Silence. The Sounds, which prolong a ſmall Matter the Expreſſion of the Speech and Voice that went before, are alſo very acceptable. But there is a kind of Abſurdity and an unavoidable Diſguſt reſulting from a long Series of unmeaning Sounds or of ſuch Sounds as have ceaſed to be ſignificant, becauſe they have warned us ſufficiently.

It happened from thence that the Muſician, who was no longer willing to produce any but animated Sounds, or who thought that he could for a long while lay aſide vocal Muſic and do without it, experienced at laſt how difficult it was to engage the Mind without fixing it by any Thoughts. Having neither the Inclination nor the Will to fill the Mind with Ideas, he redoubled his Efforts to wheedle the Ear. He ſtrove to enchant it by a Multitude of Ornaments: And being perſuaded that the greateſt Diſaſter that could befall him was to tire or lull his Audience aſleep, he ſummoned all his Induſtry to keep the Ear for ever awake by Dint of muſical Jerks and Flutterings. He laviſhly multiplied in the Inſtrumental Muſic thoſe Varieties which never appear but with Diſcretion and Judgment in a fine Piece of Melody; and grafted Diviſions, doleful Notes, a thundering Noiſe, and ſilent Times promiſcuouſly one upon another, then a long Train of Cracklings, Gambols, Rants and Ravings of all Kinds.

The fineſt Melody, when only inſtrumental, becomes inſipid almoſt neceſſarily; and is tedious at laſt, on Account of its Want of Expreſſion. It is a fine Suit of Clothes taken off the Body, and hanging on a wooden Pin: Or, if it has any Appearance of Life in it, it is at beſt after the Faſhion of a Puppet or a Rope-dancer, which may ſurpriſe you for a Moment by the Imitation of the Motions of Man, and even much ſurpaſs his natural Activity. But all this artificial Mettle has nothing in it that can be compared to the Charms of Nature itſelf, and to the Dignity of an eaſy Countenance. Nay, there may be an Appearance of Meaning in the Performance of a Puppet. When a Pantomime is making his Geſticulations, mute as they are, their Meaning is underſtood. We gueſs why he laughs or laments. We know the Motive of his Agitation, and why he ſlackens or mends his Pace. He is attracted by an Object: He flies from ſome Danger: An Intention is ſeen through his whole Proceeding: And No-body thinks him mad, becauſe there are Motives, Judgment, and a Coherency in all his Conduct: But no Man ever had a good Opinion of the Brains of one who paſſes ſuddenly from a State of Sadneſs to the loudeſt Laugh, and from Jokes and Sport to an Air of Gravity, of Tenderneſs, of Indignation, of Fury and Rage, without having any Reaſon for laughing or being angry. And pray, are not Sonatas and a great many other Pieces of convulſive Muſic an exact Picture of this Kind of Frenzy? It ſeems even that we ought to think them leſs reaſonable in Proportion as they are more pathetic. I am very far, however, from attributing to them the whole Diſadvantage and Diſgrace of this opprobrious Compariſon. They are rather like the Study which young Painters make of the ſeveral Attitudes and Paſſions of Man. They are fit to form an Artiſt, but a ſorry Entertainment of the Public.

Sonatas are valuable; when conſidered only as Studies and Rudiments.

I am even apprehenſive that an Artiſt, who acquires a uſeful Agility by Means of them, is apt at the ſame Time to loſe his Judgment, by that kind of Exerciſe, if he loſes Sight of the true End of his Art. Muſic is a Speech; it ſpeaks to the Mind, and animates all its Addreſſes to it. If, laying all Meaning aſide, the Muſician does but hunt after Sounds, and, what's worſe, after fantaſtical, diſlocated Sounds; there is a Neceſſity that he ſhould overlook the Dignity, Sentiments, and Beauties of Nature. He muſt loſe all Diſcernment of that majeſtic Simplicity, of that elegant Plainneſs, both of which enchant the Ear, without robbing it one Moment of the Privilege it has to underſtand what is ſaid to it.

Such are the Miſtakes by which the Muſician, even with very exquiſite and valuable Talents, has often perverted the right Uſe of Sounds. After having corrupted the Judgment of the Lovers of this noble Art, by accuſtoming them to the mad Taſte of Ravings, and Tearings, he miſtook their Surprize and Applauſes for a Proof of the Superiority of his Method. Emulation gradually turned the Genius of the Compoſers that Way: And they now leave no Sound unturned (as I may ſay) to outvie each other, in the producing of rapid Diviſions, and laborious Singularities. The Audience, aſtoniſhed, cry out Miracle; and the Muſician thinks himſelf in Heaven! What Hopes can we after that entertain of ſeeing him reclaimed to Simplicity, or the Ears he had habitually infatuated with the Tumult of great Commotions, brought back to a right Taſte of plain Nature. All his little Tricks are preſently detected. Eaſy at firſt, then madly tranſported, he on a ſudden ſtands ſtock ſtill. His Bow hops and trips it along: Then come the Syncopations and minim Reſts; then Roarings and Thunder; then an Echo! He now ſeems to run away: It is a hard Matter to hear him. But huſh! he is coming again; he rolls, lowers, climbs, falls down and gets up again in one Minute: Then he proceeds with trilling, quavering, chirping, warbling, ſkiping, whirling, friſking, fluttering: He will perhaps leave off his blunt Sallies, and the varigated broken Pieces of the Voice of Birds, which he is for ever mimicking to no Purpoſe: But you muſt next expect all the different Notes of a Poultry Yard, the Noiſe of Bombs and Cannon, the Squeaking and Scraping of a Kitchen-Jack, or the Hurry and Rumbling of Carts. Of whatever makes a Noiſe in Nature, the human Voice and the Emanations of the Heart are what he imitates or profeſſes to conform himſelf to leaſt of any: Inceſſantly feeding upon the marvellous and the oddeſt Singularities, he is forever rambling out of Nature.

Such is the actual Diſorder of inſtrumental Muſic. It was naturally appointed to aſſiſt our Singing; but inſtead of anſwering that Purpoſe, it has conveyed the Contagion of its Irregularities into the vocal, and has ſubjected it to all its Whims, as the only Standard of Beauty. We find it ſwerving equally from every one of the Characteriſtics of our Voice; which can never fail to vaniſh, whenever they are ſeparated from the Thought that gives them Introduction; and inſtead of affecting us by the Beauty of the ſeveral Strains which are no otherwiſe proper to the human Voice but becauſe they are ſignificative, they pretend to affect us with Notes and Sounds which are none of ours, to work us up into an Emotion about nothing. Trillings, eaſy Turnings and Windings, an uncommon Compaſs and Command of Voice, are ſo many Things foreign to the real Merit of Muſic. What you admire is, at moſt, the Merit of the Actor himſelf. Your Buſineſs was to offer to my Mind ſome judicious Thought, or ſome affecting Picture, adding to it a proportionable Emotion reſulting from the Choice of your Sounds: But, you either entertain my Mind with no Idea, or fill it up with none but that of the Compoſer's deep Science, or the Agility of the Fingers of the Performer. I had as lieve one ſhould make the Sublime of a public Diſcourſe depend on the fine Curls of the Orator.

Modern Muſic does not produce the Satisfaction it promiſes.

Next to the two-fold Extravagance of pretending to move us without making us better, and to ſpeak without expreſſing any Thing, modern Muſic is guilty of another, of which every one may be judge. Muſic aims at pleaſing, no doubt: Nay, it has no other Deſign: But it defeats it, and perverts the Pleaſure it promiſes us, by its own intrinſic Character. All liberal Arts have a Reſemblance to each other. Whatever they produce is equally ſubordinate to common Senſe and Decency. It is then with a Piece of Muſic as it is with a Poem, a Picture, an Apartment, an Edifice, a ſumptuous Habit; every Thing, in ſhort, which is diſpoſed and ranged ſo as to make an agreeable Impreſſion. It is a Totality wherein the Mind expects to diſcover all the Skill of the Art together with ſome Ornaments; but if you accumulate the latter, the Mind loſes itſelf in the Crowd. It can no longer enjoy a Beauty drowned in a Multitude of others, that blunt the Senſe you might otherwiſe have of it; and this you will experience in *Italy* as well as in *France*. The true Elegance of Ornaments can never be perceived but in Proportion as Diſcretion, Choice, and, above all, Decency, govern the Whole. Now Decency takes in the Subject, the Place, the Time, and Perſons. It often rejects more Flowers than it will admit. There is a Neceſſity that thoſe delicate Differences, which are the real Sources of Beauty, ſhould vaniſh, when the Artiſt thinks of nothing but dazzling us with an undigeſted Heap of Embelliſhments. A Cabinet crammed up with them degenerates into a well ordered Frippery. It is a true Broker's Shop.

Mr. *Boffrand* has made very ingenious Applications of the poetical Art to that of the Architect, and I may likewiſe apply to Muſic the Rule by which we judge of our Writers. *Marôt* and *Deſportes*, though ſomewhat incorrect in their Manner, had, in the XVIth Century, begun to give our Language a Turn that was prodigiouſly natural and engaging. *Ronſard* had like to have ſpoiled all, by heaping far-fetched Expreſſions, out-of-the-way Figures, numberleſs Ornaments, *Greek* and *Latin* Locutions, and a great Shew of Learning. The Court reliſhed, or rather was preached by him into this bombaſtick Goût. The Luxuriancy of Praiſes, and the Phrenſy of Imitation were ſoon after carried to ſuch an immoderate Height, that no Mortal would have had the Confidence to yawn at reading *Ronſard*'s Writings, or to reliſh any other Method but his. But they were ſoon out of Conceit with it, and the rich Simplicity of *Malherbe* diſſipated the Illuſion for ever.

Conſider the Productions of whatever Art you pleaſe, and you will find the Prerogatives of Simplicity and Conſideration to be every-where the ſame. The *Gothic* Architecture was light and bold. It made enormous Maſſes to reſt upon the ſlendereſt Supports. It covered every Thing with Rainſſeaux, Grapes, Foliages, Pyramids, Flower-work, Trefoil, Chamfering, Maſcarons, wide gaping Mouths, Claws, or Heads of Birds, Rabbits Ears and Heads, and wry Faces of Monkies; nor did it any where forget thoſe little Men, who are officiouſly lending their Shoulders, to re-unite the long Branches and the whole apparent Weight of an Arch. The *Gothic* Architecture aimed chiefly at the Marvellous: But do we ſee its Beauties now much regretted? The ſame Diſcernment which makes us extol the Elegance that ſhines with ſo much Simplicity through every Part of the Front of St. *Roch*'s Church, or the no leſs plain Loftineſs which ſtrikes us with Admiration in that of St. *Gervais*, makes us look with Pity upon the Heap of Ornaments (and of very bad Ornaments too) that have been laviſhly beſtowed on thoſe of St. *Lewis* * and St *Etienne du Mont*. It is undoubtedly the ſame with plain Muſic and Muſic overloaded with Ornaments. Simplicity is not itſelf the Producer of Beauty: But it preſents it to our Eyes. It ſets it off, and leaves the Mind at full Liberty to judge right of it. We have then the true Principles of Criticiſm in us: And when Arts are to be judged of, the Names of *Ronſard* or *Malherbe*, of *Perrault* or the *Cavalier Bernin*, of one Muſician or another, are nothing to the Purpoſe, and decide nothing *pro* or *con.* We judge not of a Piece by its Author, but of the Author by the Piece. Nay, the Opinion of a learned Man may be a dangerous Prepoſſeſſion.

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* Rue St. Antoine.

If *Plato* is but on my Side, ſaid a certain *Grecian*, I matter it nothing if I have diſpleaſed all the World. This, which has been ſo many Times repeated, has authorized a Multitude of wrong Notions. Is it not perceivable, that what has the general Approbation is a more ſtriking Beauty than what is only felt by *Plato*, or a few Partizans of great Reputation? What pleaſes only a Set of private Men may very well borrow its attractive Power from tranſitory Prepoſſeſſions, from a Party-taſte, or even from Habit alone. Nothing, on the contrary, ought to be leſs ſuſpected than what continues to pleaſe the Majority. But whence can this Difference proceed? Why have all Ages applauded *Virgil*, whilſt *Lucan*, with a more ſparkling Wit, is hardly read by a few. The Anſwer to this Queſtion may be a Key to the finding the ſtandard Merit of all Arts: And an Inſtance may here be to us inſtead of a Principle. Mr. *de la Motte*, to be liked by his Readers, ſuppoſes them all endowed with a great deal of Wit; being himſelf very witty through every Part of his Works. 'Tis certainly aſking too much: 'Tis a bad Omen for his Reputation. *La Fontaine*, on the contrary, gives Wit to his Readers, without ever ſuppoſing the Neceſſity of any in them: A Preſage this, of an immortal Fame. The Learned, and the Artiſts, are appointed to inſtruct and ſerve the Multitude. They are obliged to come down to their Level, not they to rack their Brains to unriddle what they ſay, or gueſs at the Meaning of what they are about.

The Sublime in Point of Eloquence, Poetry, and Decorations, but in Point of Muſic more than of any other Art, ought never to be confuſed and clogged with Ornaments. It muſt be diſtinct and acceſſible to all; And what we call *Art* is, in its trueſt Acceptation, only a Facility of producing an Effect that will engage all Sorts of Capacities by Impreſſions already tried.

When a Thing pleaſes a few learned Men, it is not perhaps without ſome well grounded Motive of Eſteem. But this is not by much the Criterion of univerſal Goodneſs and Beauty. The Learned, in Conſequence of the narrow Bounds of the human Penetration, or for Want of proper Underſtanding, are apt to intoxicate themſelves with certain Notions, to ruminate upon them with Complacency; to turn all their Capacity that Way, and eagerly to eſpouſe a Syſtem, a certain Taſte of Muſic, a peculiar Manner of Declamation, and a Method of their own of Painting or Building. The Evil increaſes then in Proportion to their Credit, and the Number of their Partizans. The Ideas, to which they are ſo zealouſly bigotted, becoming the Rule of their Judgments, they praiſe or blame Things according as they ſavour more or leſs of their own way of thinking: Whence it often happened that both their Praiſes and Blame were equally inſignificant. It is not ſo with Things, which, at the ſame Time that they inchant the Connoiſſeurs, make a lively Impreſſion upon the Multitude. There lies the Sublime, the True, the Durable; and pray, obſerve that this Kind of Beauty is ſimple, plain, and above all Things not very artificial. All is dogmatically ſententious and fine, both in the Panegyric of *Trajan* and in *Seneca*'s Treatiſes; but Man muſt have good Courage to go through them: It is perfectly racking one's Brains. On the contrary, you need but underſtand *Latin* and *French*, to delight in reading the *Eneid* and the *Lutrin*, *Tully*, or *Boſſuet*, *Livy*, or the *Abbé de Vertot*. You never leave them but with Reluctance. We alſo need but have a tolerable good Ear to be raviſhed with the Melody of the Tunes compoſed by *Lulli* and *Mondonville*, though different in Character. We ſtill repeat the merry Tunes of the Muſician of *Charles* the IXth. There is the true Sublime ſtill felt in Pieces of plain Song that were compoſed in the Time of St. *Lewis*. Age cannot diminiſh the Beauty of them, and the Impreſſion they make is ſtill the ſame, except when Majeſty, Gaiety, Melancholly, and all the Characteriſtics of fine Melody happen to be confounded together, and grow rough by the heavy Uniformity in the Performance. This knocks every Sort of Beauty on the Head.

But as the utmoſt Volatility, in Point of ingenious Productions, has been in Faſhion among thoſe who are fonder of ſparkling than of judicious Thoughts, even ſo far as to ſtile *Virgil*, *Deſpreaux*, *Racine*, and *Moliere*, common Poets, fit to be pored upon only by ſecond hand Wits; the volatile Goût in Muſic is up in its Turn. *Lulli*, *Campra*, *la Lande*, *Deſtouches*, and *Couprin*, whoſe Compoſitions are ſtill the Delight of the Multitude, are now ſtiled currently *common Muſicians* in our pretended-reformed Concerts.

I would fain know why, of all the Verſes which our modern Muſicians dreſs in Furbelow, or Pink, and cut in Trinkets and Gew-gaws, not one can deſcend ſo low as ourſelves, and make its Fortune among the Commonalty. But a little while ago, the Tunes, which had been current at Court, uſed to receive the ſame Favour among the People. Every Mortal ſung, becauſe it was then allowed to make uſe of the human Voice in ſinging. Now we hold our Tongues becauſe we hear nothing but the chirping Diviſions of the Canary Bird, and the Sighs of the Nightingale. But, would you find in a Million of different human Pipes, an hundred, nay, a Dozen of them able to imitate the Nightingale: And were it poſſible to mimic his Manner, would not the ſubſtituting this warbling Way to human Singing, be ſwerving from Nature, and rather ſpoiling than improving its ſweet Gifts! A Lady ought no more to ſtrive to introduce into her Songs the Sighs and Volubility of the Tongue of this Bird, than ſhe ought to imitate, in her Dancing and her whole Gait and Behaviour, the wild, reſtleſs, over-haſty Motions of the Eyes, Head, and Body of a Linnet.

We of the Commonalty are little affected by Charms that require ſo much Apparatus. We readily leave them to our People of the grand Monde, among whom they ſeem to have found their principal Refuge. But, how many Complaints are made againſt this bad Taſte, even among thoſe who are moſt expoſed to the Neceſſity of hearing with and under the obligation of applauding it? How many Men of Quality are ſcandalized to ſee Paint and Diſguiſe made uſe of to pleaſe them?

Emulation and great Efforts doubtleſs produce Novelties: But the Diſtance is often very great between the Learned, the Artificial and the Agreeable. Learning is liked only as it is made to agree with the moſt univerſal Taſte.

Inſtead of ſetting the *French* Taſte in Oppoſition to the *Italian* (all which Terms become unpleaſant and almoſt injurious according to peculiar Prejudices) let us leave each Nation in Poſſeſſion of their reſpective Talents and good Succeſs. There are really raviſhing Beauties on both Sides. Let us than rather diſtinguiſh two Kinds of Muſic, each whereof had its Partizans both on this and that Side the *Alps*. The one borrows its Tunes from the Sounds natural to our Pipe, and from the Strains of the human Voice, which ſpeaks in order to make other equally affected; and it does it always with Eaſe; without the leaſt Effort; and almoſt without Art. We ſhall call this *ſinging Muſic*. The other aims at ſurpriſing an Andience by the Boldneſs of its Sounds, and would fain be thought to ſing, tho' it does but meaſure Noiſe and Diviſions. This ſhall be named *the rough Muſic*. Inſtead of crying the one down in order to eſtabliſh the other; let us try to make them both beneficial to us, and to point out their reſpective Advantages, if they have any real ones.

There is no Need of inſiſting long upon the Praiſe of *ſinging Muſic*. It has, in the firſt Place, the Merit of Melody, the Sweetneſs of which has been equally felt by all Nations and Ages; as it was a conſtant Mixture of the fineſt Sounds with an agreeable Meaning, and it is perfectly conſiſtent with the fineſt Harmony, which is by no Means the Production of modern Muſic. The Proof of it is derived from the Multitude of Concords produced by every Row of Pipes in the Organ, and which have, for many Ages, been mixed in thoſe melodious Tunes, which the Multitude has always been deſirous to hear.

But, what Benefit ſhall we be able to reap from the rough Kind of Muſic? If it cannot be of any great Uſe, it will help us perhaps to avoid a very great Evil. The Muſicians of the latter Age went ſo nicely Hand in Hand with the Poet who made Words for them, that you would have thought the two Operations to be but one. Poetry and Sounds ought naturally to proceed from one and the ſame Head, as they are two Things appointed to be connected in one. But, *Quinaut*'s Poetry and *Lulli*'s Muſic tallied ſo perfectly well with each other, and beſides, the Words were ſo very ſonorous, notwithſtanding the enervate Style, and the Tunes ſo full of Expreſſion, that, except the Foreigners, among whom this perfect Agreement muſt naturally have loſt a great Part of its Value, the Impreſſion of Delight was as general among the Small as it was among the Great. The Melody did not ſuppoſe any Skill to be felt and reliſhed. The Meaning of the Words was commonly but too intelligible, and the Enchantment was univerſal. A new Song had hardly been heard at *Paris*, but they ecchoed it from Town to Town, even to the Foot of the *Pyrenees* and the *Alps*. How many *Italian* Words are likewiſe well received all over the World, becauſe they are Expreſſions of Nature and Truth, which are of all Nations and Countries without Diſtinction? How many *French* Words adapted to *Italian* Melody are daily repeated among us, from an Effect of the Impreſſion which Nature ever makes? Nothing is rejected but what is heavy and over-ſtrained; and it is this Attention in ſhunning what is coarſe or affected in itſelf, that conſtitutes the deſireable Perfection, not only in Muſic but in all beautiful Arts without Exception.

It is true, *Lulli*, *Quinaut*, and their firſt Succeſſors had run headlong into the greateſt Fault of Muſic, which conſiſted in ſacrificing Truth and Utility to Diverſion. Inſtead of employing Pleaſure to convey Inſtruction, Sentiments, Patriotiſm, a Love for extraordinary Talents and great Men, and a Reliſh for Virtue, into every Mind; they often gave the fineſt Out-ſide to what was fitteſt to corrupt the Heart: A Diſorder which together with a flat verboſe Verſification has ſo many Times expoſed them to the Reproof of the honeſt *Deſpreaux*. They ſhewed a very great Diſregard for ſound Reaſon in the Choice of their Subjects. They ſung the Amours of the *Paladines*, and the Metamorphoſes of the Gods. They added the Extravagance of Enchantments to the old Tales of Chivalry and Idolatry, and ſeemingly undertook to give the Mind a Diſguſt for the Simplicity of Truth, by accuſtoming it to the Bombaſt and Pageantry of marvellous Events. They, with great Apparatus, aſſociated Painting, Machines, and Declamation to their Art. They left no Stone unturned to inebriate Man's Reaſon, by varniſhing over, even with the Colours of Virtue, and ſetting a fine Gloſs upon Rhodomontade, Vengeance, Adultery, and all Vices in general.

A Mother of a Family, on coming out of a public Muſic-room, was delighted to ſing with an undaunted Air before her Huſband:

Hymen, quand le ſort t'outrage
Ne t' en prend point â l' amour (a).

A young Lady retained the whole Subſtance of an Opera in your Verſes, and made the Epitome of *Quinaut's* Morals and Doctrine, ſinging thus to a Circle of delighted Youths.

Rendez vous jeunes cœurs : cedez à vous deſirs,
Tout vous inſpire un tendre badinage.
Ne preférez jamais la Sageſſe aux plaiſirs.
It vaut bien mieux être heureux qu' etre ſage.

Thus had the moſt luſcious Doctrine been intirely reduced into Maxims, and ſet to Muſic to procure very needleſs Inſtructions to the Public.

But notwithſtanding this Contempt for the primitive Deſtination of the finer Arts, which conſiſted only in procuring the real Good of Society, and in rendering Virtue amiable; *Lulli, Campra, Mouret, Deſtouches,* and ſeveral of their Imitators, deſerved, however, the Applauſe of the Public ; by their Fidelity in obſerving the ſecond fundamental Rule of Muſic, according to which they were obliged to buſy the Mind with ſome Object, and aid the Senſe by ſuiting Sounds to the Words. They knew Man too well, and had too great a Regard for his Inclinations, to think they could pleaſe him long, in treating him like the Bull-finch or the Green-Bird, who never have any Ideas, and paſs whole Days in learning, or repeating meer Sounds.

(a) Theſe are the Words of Rouſſeau ſet to Muſic by Bernier, to ſerve as Family-Inſtructions.

This is the actual Ridicule of the rough Muſic. But, at the ſame Time that it amuſes us with no more than a ſounding Noiſe, as tho' we were Brutes, it nevertheleſs avoids the firſt Inconvenience, and does not poiſon our Minds. It does not teach us Evil, ſince it either teaches us nothing, or entangles what it fancies it ſays to us with ſo much Confuſion, that it renders it utterly unintelligible.

We may, after this clearing up of the Matter, profit from both Kinds of Muſic, by regulating their reſpective Provinces. We may negociate a Kind of Articles between them. But as we are inveſted with no full Powers for that Purpoſe, we ſhall not propoſe what follows otherwiſe than as a Project.

The Firſt PART of the ARTICLE.
The Province of the rough Muſic.

Article I. The rough Muſic ſhall remain in Poſſeſſion of public Shews and Concerts, where the ſinging Muſic cauſed infinite Evils formerly.

Article II. In order to faciltate, in an amicable Manner, the Progreſs of the rough Muſic, and to diſcredit or even pull down in Families the dangerous Reliſh they might ſtill have for the Melody of the laſt Age, the indifferently wealthy of our Cities ſhall be intitled, at a prodigious Charge, to procure themſelves an Opera, or at leaſt a public Concert, where ſuch of our honeſt Inhabitants as fly themſelves for Want of Thought and Employment, may have free Quarters, and feed at Diſcretion upon inſignificant Sonatas, upon *Italian* Words which are as dark as the *Alcoran* to them, or upon ſuch *French* as is convulſively turned into *Arabian* by the Caſcades and Hiccoughs of the Pronunciation: It being the *Bel Air* of the preſent Age to articulate Sounds that can make no Senſe, and to attempt creating Emotions and working up the Mind into ſome Concern about it knows not what. Such Conceſſions as theſe (we expect) will appear odd enough to the common Claſs of our Men of Senſe. But, we ſhall deſire them not to be over-ſevere in this Reſpect, out of meer Regard to good Manners, to which *Quinaut* and *Lulli* have done greater Injuries than the Eſtabliſhment of a hundred rough Concerts could poſſibly do.

Article III. The Liberty of the ſaid Eſtabliſhments ſhall be maintained notwithſtanding the Reclamations, Cries, and Complaints of Legions of Poor purpoſely ſwarming under the Windows of the Muſic-Room, to diſturb the Concords of the Concert by aſking for Work or Bread in Tones maliciouſly diſcordant.

Article IV. Muſicians ſhall for the future be freed from the Neceſſity of compoſing Words, or of having any compoſed. They ſhall be at Liberty for the Support of their Melody to content themſelves with giving out ſuch inarticulate and merely fantaſtical Sounds as they ſhall think to be conſiſtent with the Volubility of our modern Flouriſhes.

However, if, from the Remains of Condeſcenſion for the ancient Rubric, which has always inſiſted upon a Correſpondence between Speech and Melody, they think it proper ſtill to unite their Sounds to ſome Words, they may previouſly compoſe the Tunes, and then leiſurely look out for Words to be adapted to them. Here, they are altogether without Conſtraint: for they may not only pick out theſe Words in the *Italian*, the *Turkiſh*, or any other Language as little underſtood; but, if the Muſician is pleaſed to uſe Words out of his own Mother Tongue, he ſhall alſo be at Liberty to have them without the leaſt Meaning. Meer Coherency, meer Words will be enough for him. He may, for Inſtance, as has already been done by a Virtuoſo, fully convinced of the right Uſe of the rough Muſic, take for Words fit to be dreſſed in Melody the following:

Fuir au Mogol
Avec Saint Paul;

And at his Will compoſe long-winded Pieces, that ſhall be downright Rattling and Noiſe.

The Public may poſſibly exclaim, at hearing this Article, that it is an injudicious Indulgence thus to grant the Compoſers of Muſic Prerogatives by which they are authorized not to know ſo much as *A* and *B*. We readily acknowledge this to be ill contrived. But, in the Neceſſity of the Choice, let us preſerve ſound Morals, tho' it were at the Expence of Sound Judgment. Upright Hearts and true Patriots will rather chuſe never to ſing, or even to underſtand a Word of what is ſung, than to ſee the moſt exquiſite Talents go hand-in-hand about fertilizing in all Hearts the Principles of a Libertiniſm utterly deſtructive to the Eaſe of Families and Society. May thus the rough Muſic proſper in the Prophane; ſince it is neither more ſignificant nor more ſcandalous there, than Blows laid upon an empty Trunk.

But in the other Part of the Agreement we have it in our Power to inſiſt upon and vindicate the Prerogatives of common Senſe as well as of good Manners.

The Second PART of the AGREEMENT.

The Province of the ſinging Muſic.

Article I. The ſinging Muſic ſhall remain in or be reſtored to the Poſſeſſion of eccleſiaſtical Solemnities, and inſtead of ſurpaſſing the mad Flights of theatrical Muſic, it ſhall, according to its primitive Inſtitution, be wholly taken up with the Care of inſtructing Men in ſinging God and his Works in a plain affecting Manner.

Article II. It ſhall always continue to draw its Followers, its Subſtance, and raviſhing Varieties from the inexhauſtible Source of Harmony. But, being conſecrated to the divine Service of Chriſtians, its principal Taſk ſhall be to pleaſe the Multitude, particularly by the different Characters of an ever majeſtic, ſoft, and practicable Melody. It ſhall render to Religion the ſame Services which *Lulli* rendered to Vanity. He purpoſely extenuated his Talents to make himſelf popular: Nor did he publiſh any Thing that was not ſingularly melodious and eaſy to be retained. It would have coſt him nothing to have compoſed in the learned difficult Strain. But, his Friends have more than once ſurpriſed him all in a Sweat in his Study, in purſuit of a Melody which every Singer could repeat without a Maſter.

The Motives of theſe two Articles are juſt. The Appointment of Chriſtian Congregations and the Subjects ſung among them, are equally inconſiſtent with the Whims and Hurricanes of the rough Muſic. But avoiding Indecency among a Crowd of Adorers is not ſufficient: All ought, beſides, to promote the Sentiments, and contribute to the Adoration. The Melody to be admitted there muſt *go to the Heart and be levelled to the Multitude.* If the Church pays very dear for having an Organ and a muſical Choir, it is not in order that *Philidor*, tranſported with the Beauty of ſome learned Compoſition, ſhould roll his Eyes towards the Arch, or *Gombaud* lurk in the Corner of ſome Chapel in a Rapture about the Compaſs and Flexibilty of a Voice; whilſt the People gape and leave the Church. The Organ and Melody are for thoſe People. Muſic-Maſters muſt know that they are appointed to inſtruct the Congregation, not indeed by rapid Flights, every part of which becomes imperceptible to them, not by an Harmony too deeply learned for their Capacity, not by long tedious Pieces that tire them; but by ſuch Melody as may be felt by all, by Tunes of ſuch an eaſy Turn as will imprint them in the Memory, and cauſe them to be repeated in every Family. Propoſing to pleaſe *Philidor* and *Gombaud*, in ſuch a Place eſpecially, is being ſure of diſpleaſing all the World.

Article III. Muſic, even the moſt ſinging, ſhall not upon any Account wreſt from Chriſtian Congregations the Melody of the Pſalms, nor appropriate Hymns and Canticles to itſelf in an excluſive Manner. All the Tunes in which the People are allowed to ſing in Chorus, with the Baſes and Inſtruments which conſtitute the Ground of the Melody, are ſufficiently ſoft to move them, and of a Simplicity which can never hinder them from being full with the Meaning of the Words they recite. The Multitude of Voices occaſions no Confuſion here, whether they ſing one Verſe after another, or repeat in a grand Chorus, and by way of Acclamation, what the Muſicians have juſt taught them. INDULGING THE TASTE OF THE PUBLIC IS THE

ONLY OBLIGATION AND PRIVILEGE OF MUSIC. It ſhall pleaſe the Majority of ſuch of the Audience as have had a liberal Education, by procuring them, from time to time, Pieces that may excite and improve there Diſcernment. It may have *French* Words compoſed and approved in order to ſet them to Muſic, and begin the Tune for the Connoiſſeurs to ſing them after divine Service, inſtead of an inſignificant Voluntary. This would be a ſkilful Method to teach them at once how to ſing and pray. Nor ſhall theſe agreeable Inſtructions be long before they are catched at by even the loweſt Claſs of People. A Muſic-Maſter will always be allowed to be a ſenſible Man with the beſt Notions.

Article IV. The Poets, who aſpire to the ſame Glory, and try to alleviate our domeſtic Toils by the Amuſement of vocal Muſic, ſhall for ever renounce the abſurd Cuſtom of carrying on a long Drama in Songs, and above all of weeping melodiouſly. By ſparing the public the inſipid Wonders of enchanted Caſtles, of Apparitions of imaginary Genii, they will alſo ſpare themſelves the Confuſion of not having been able to pleaſe otherwiſe than by indulging the moſt infamous Paſſions, or by keeping their Audience in an eternal State of Puerility.

They may oblige the whole World and get its Eſteem, by a nice Improvement of the vocal Practices, and even by ſtrictly reconciling Dignity and Mirth in our moſt popular Songs. The chief Induſtry of Artiſts conſiſts in imbelliſhing what the Public cheriſhes, not in forcing it to admire what makes no Impreſſion upon it. Next to the critical Diſcernment of what is ſure to engage the greateſt Number, nothing is ſo neceſſary as having a quick lively Senſe of the Meaning of the Words to be ſet to Muſic, and delicately to make the muſical Expreſſions tally with it. Any other Knowledge is but a Source of Tireſomeneſs. Good Poets are ſingularly invited to make uſe of the Cantata; a ſmall Poem equally fit to make Part of a Concert, and to improve at Home the Voice of every private Perſon: a ſmall Poem wherein the Unity of the Subject, the Drama, the Pathetic, the Changes of Melody, the Union of ſeveral Inſtruments and Voices, and all imaginable muſical Beauties may be procured within the exact Compaſs of Time that will not tire out the human Patience. The Cantata would advantageouſly replace the *Latin* Motets, which are not as yet admitted into certain Cathedrals, and make but an indifferent Figure in a Muſic-room. The leaſt Merit of the Cantata is its being begun among us. The Succeſs and Utility of it are infallible, if the Poet, juſtly diſguſted at laſt with the Rubbiſh of Fables, and hating equally filthy Images and dull Moralities, will but chuſe his Subject among the Wonders of Nature, or from the fineſt Paſſages both in ſacred and profane Hiſtory. Theſe are the Sources of the cleareſt Inſtructions and of the ſureſt Emotions.

Painting.

Let us from the Enchantment of Muſic paſs on to that of Painting: Not, indeed, to examine the Principles of it, which have been ſo often, and ſo learnedly diſcuſs'd but to inform ourſelves of the true Deſtination of the Pleaſure it gives us.

The Origin and Deſtination of it.

It is in its Origin a Writing, a convenient Method to imitate Things abſent or no longer in Being. The vaſt Uſefulneſs of this durable Language, the Facility of underſtanding it, and the Delight inſeparable from it, have infinitely animated its Progreſs. The Abuſe of this, as well as of the other Arts, was the deriving from it Pleaſures without Utility.

Let us here recal the important Principle of the Deſtination of Pleaſures. The Intention of the Creator who grants them to us, is conſtantly the ſame in the Diſtribution he has made of them. No Pleaſure but what conduces to our Advantage; no Pleaſure but what Reaſon ought to reject, when it no longer produces this deſirable Effect; no Pleaſure, in ſhort, that it ought not to ſhun with Horror, when it either corrupts the Judgment of private Men, or deſtroys the Good of Society. Whatever pleaſes our Smelling is an Intimation what the Mouth is to admit or refuſe. Sometimes it is a Corrective deſigned to moderate Impreſſions otherwiſe diſguſtful and dangerous. Savours are a Warning. It is the ſame with what affects our Hearing and Sight. The leaſt among Pleaſures, ſuch as thoſe of the Smell, affect us but faintly, becauſe their Utility is commonly but ſmall, and the Impreſſion of them is never ſtronger than when the Notice it gives us, both as to good and bad, is of great Concern to us. This Characteriſtic is ſtill more remarkable in the other Senſes. The quicker their Pleaſures are, the greater is the Utility they are connected with; ſo that taking any affecting Pleaſure, and deſpiſing at the ſame Time the excellent Bleſſing of which it was the Incentive, and, in one Senſe, the Reward, is diſhonouring Nature and ſubverting the Work of its Author. The Taſtes of Meats and Drinks, which ſome People endeavour to make agreeable to themſelves when their Stomach is already full, become from that Moment ſo many criminal Pleaſures, not very diſtant from Diſguſt. The greateſt Delights, our Ear is ſuſceptible of, becomes as little reaſonable when they corrupt the Mind; and they are the moſt direct Ways to tire it, when they amuſe it with nothing. Such are again the Pleaſures of our Sight. We have already obſerved it: Colours are to the Eye, what Sounds are to the Ear: And as the Sounds of the human Voice are hardly ſeparable from Speech which lends them a Meaning; it is not very natural that Colours ſhould preſent themſelves alone and without being annexed to ſome Object that may, after having given them a determined Form, receive in its Turn ſome diſtinctive Ornament from them. We have ſeen the double Diſorder of Muſic which conſiſts in having ſeparated Harmony too much from Melody, and in having rendered the latter criminal. We may likewiſe make a twofold Abuſe of Colours, by taking a World of Trouble to range them without characteriſing any Thing, or by making them ſerve to amuſe us with Objects either uſeleſs or pernicious.

Of the firſt Kind would be a long Series of Tapeſtry Hangings all in *Iriſh* Stitch that ſhould be ſucceſſively expoſed before us for whole Hours together, obſerving among them an Order, and Rules grounded upon the Affinity of Colours. This would be a kind of Symphony propoſed to the Eye: It would be to our Sight what a Sonata is to our Hearing *(a)*, But Sounds and

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(a) This is very different from the Intention of the ocular Harpſichord of the reverend Father Caſtel (a learned Jeſuit) who has employed

Colours being to the Soul the natural Signs of the Things about which we have a Mind to employ it, it muſt needs fall into a languiſhing State, when theſe Sounds tell him nothing, and theſe Colours are connected with nothing: As it is ſtill more intimately moved and penetrated by fine Sounds than it is by fine Colours. This long Train of Shades, even moſt ſkilfully combined, would tire him ſtill ſooner than a Sonata. Nor do we indeed ſee our Painters fool their Time away in preparing for the Eye Concerts of Colours that would have no other Effect but that of ſtarving them. They indeed have much better Reſource in the other Abuſe of Colours, *viz.* painting Objects that may indulge criminal Paſſions.

But, are they then ſo blameable in that? Nothing, it ſeems, has more efficaciouſly contributed to bring Painting into Vogue than the ſeparating Pleaſure and Inſtruction. And it is plain, that the leſs Painting ſtrives to inſtruct and buſy us with uſeful Things, the greater the Progreſs it neceſſarily makes. People are fond of nothing but what is frivolous or licentious.

I underſtand, and will even admit this Argument, if you will but grant me the following, *viz.* That a Man, who robs another of a Crown on the Highway, is but indifferently ſkilful; but that he improves when he kills in order to get that Crown more ſpeedily. He raiſes himſelf to a noble Hardineſs: he is arrived at the Sublime, when in order to ſatisfy his revengeful Diſpoſition, or any other private Intereſt, he lays waſte a whole Province, or poiſons the public Springs. Profligateneſs

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employed the Frets and Jacks of the Harpſichord to expoſe to the Eye, and take away, at Diſcretion, Points differently coloured; which affords him a quick Means to demonſtrate his Syſtem upon fundamental Colours, upon the Mixtures which may be made of them, and upon the regular Varieties reſulting from theſe Shades as well as from the ſeveral Degrees of Lights and Shades. His Intention was not to introduce an ocular Muſic. Nor can we refuſe our Praiſes to an Invenrion which may not only clear up a very fine Queſtion in Phyſics, but be alſo of Service to Painters, Dyers, and all Men employed in Colours. See l'Optique oculaire, chez Briaſſon.

has attained to its higheſt Degree of Perfection, when the Evils it creates are contagious and it finds Methods to perpetuate them. A great Painter, by indecent Images, and a ſkilful Engraver by diſtributing a Thouſand Copies of them, draw in young People, and inure their Minds to Impudence. They ſucceed, both at preſent and hereafter, in baniſhing Innocence and good Manners, which are the only Safeguards of Society. And really, what Support can Society expect from ſuch as delight in ſeeing all Rule and Virtue trampled upon? Depending upon Men who have once taken a liking to Debauchery, or a Contempt of Religion, is pretending that the Pulp of Fruits ſhould remain ſound, whilſt they are certainly rotten at the Heart.

The Diſorders of Painting.

Nor muſt we think, that, in order to make an Advantage by the Progreſs of Licentiouſneſs, Painters need multiply the Repreſentations of the moſt laſcivious Attitudes and the moſt criminal Practices. No: Allowing themſelves ſo much as the Painting of Nudities, will ſtill ſufficiently ſerve their Turn. They even do not wrong themſelves a whit by a Drapery, a Foliage, or a Gawze. They gain their Ends as well that Way, and paſs for having a Regard for Decency. But this is a fallacious Modeſty which does but aggravate their Condemnation. Would they be contented both for themſelves and Family with the Slightneſs of theſe Garbs in Public? Sure they would be afraid of being hooted by the Populace, and puniſhed by the Magiſtrate. Now, the ſame Motive and Concern, that makes a Man be clothed in Public, will not allow of the leaſt Indecency in Pictures. Pray, when the Laws enjoin Painters to be clothed in the Streets, is it in order to preſerve them from Cold? We commonly catch Rheums by the Cold of the Head, and yet there is no Law or Cuſtom which forbids them to go any where with a naked Head. There is then a Decorum grounded upon univerſal Ideas, maintained by the Laws, reſpected by the Public, and inſulted by Painters.

The Difference between the Outrage they would do to Honeſty by appearing naked in Public, and that which they do it by ſlightly covered Nudities, is, that every body will ſay of them in the firſt Caſe, theſe People are mad; and it may be ſaid, as to the ſecond, theſe Men are ſtriving to introduce Barefacedneſs and Impudence every where, becauſe they live by them. Now, it is much leſs illegal and more tolerable to be mad, than to poiſon Society. Therefore, a Maker or Seller of Nudities is a thouſand Times more deſpicable and more odious than the Man who expoſes his Nakedneſs in Public. A very plain Conſideration will compleat our being ſenſible how a Painter actually running about mad without Clothes on, may nevertheleſs be leſs crack-brained than he who diſpenſes with Clothing his Figures. We have already obſerved that Muſic was a Speech, and the Art of Painting a true Writing. Sound becomes a Language only when it is articulated, and attended with ſome Meaning. When alone, it may indeed tire, but never hurt us. We are in ſome Danger of yawning at the hearing of a Sonata; but when we liſten to a Cantata full of Love-expreſſions, we run the Riſk of ſwallowing the moſt dangerous Poiſon. Colour, likewiſe, ſignifies nothing by itſelf, and can do no harm alone. An Hour may be very innocently, though moſt tediouſly, beſtowed upon conſidering over and over Skains of Silk variouſly ſhaded. Colour does not become a Writing, and a dangerous one beſides, but when, being ſeconded by the Shades and Out-lines of Figures, it preſents to the Eye Objects, Actions, and the Expreſſion itſelf of the moſt lively Sentiments. A voluptuous Philoſopher that ſhould read Lectures to Youth, on Purpoſe to teach them that the Allurements of Pleaſure is the whole Sum of their Duty and Conduct, would be looked upon as a pernicious Man, capable of deſtroying Maxims which are moſt neceſſary for the Preſervation of Families. Nevertheleſs, how cold would ſuch Lectures be, in Compariſon of the Inſtructions of our Painters! A ſingle Glance lays hold of them. When they expoſe theſe Pieces of Writing, ſo intelligible to all, in our very Temples and in public Halls, where every body is admitted, what Judgment would they have us entertain of their Intention? Pope *Adrian* VI, when he entered into the Chapel of the *Vatican*, uſed to ſay, at ſeeing the Nudities with which an Artiſt more learned than judicious has filled it, that he thought he entered into the Stove of a Bagnio. This was reproaching *Michael Angelo* with having had very wrong Notions. But, expoſing to the Eyes of a Million of Inhabitants the licentious Acts of the Heathens and the Practices of the Golden-age, implies more, indeed, than wrong Notions barely. Theſe Pieces of Writing plainly ſignify, that the Modeſty of our Manners is an unreaſonable Conſtraint; that it is a fine Thing to ſhake off the Yoke of Rule and the Inconveniency of Decorum; that, in ſhort, Common Senſe, as well as the ſoundeſt Philoſophy, naturally calls us back to the Simplicity of the firſt Age, to the Liberty of the *Braſilians* and the *Patagons*.

It is hardly conceivable how Poetry, Muſic, and Painting, have had the Courage, in the Eyes, as it were, of ſo grave a Religion as ours, to run headlong into ſuch Exceſſes, without the leaſt Regard to the moſt generally accepted Notions. But, let us not lay this to the Charge of thoſe exquiſite Arts. The Reproach muſt intirely fall upon falſe Philoſophy, which cannot but cover them with Shame, by directing and making Apologies for them, after having perverted their Utility.

What is then the firſt Deſtination and lawful Aim of the Art of Painting? It borrows all its Merit from the Inſtructions it affords to the whole Body of Society, by conſtantly bringing before their Eyes ſuch paſt or obſcure Things as are or ought to be of Concern.

The true Advantages of the Art of Painting.

It is a real Advantage to a State when the Art of Painting is cultivated there; eſpecially that Part of it which is called Drawing. The Practice of this is no ſooner become common, than it keeps all Arts, as it were in Awe. It obliges them to give beforehand Plans and Models of every Thing they promiſe to perform. It enables all Eyes to judge of a Work not yet executed, and to prevent any Evil, by reforming a Project rather than run the Riſk of perceiving a Diſorder or an Inconvenience, when it is no longer poſſible to remedy it. Thus it conveys into whatever is done for us a Truth and Symmetry, which inſure us the Enjoyment of a thouſand Beauties in Things which ſeemed no Way relative to the Art of Painting.

We are always ſure of ſeeing that Art conſulted by the Founder in the caſting of a Figure, by the Embroiderer and Tapeſtry-maker, by the Weaver in the ſetting off a rich Silk with a Variety of Flowers, and by the Director of a public Pomp, of an Entry, or any other grand Decoration. But who could have thought it had given good Informations to the Blackſmith, the Gardiner, the Joiner, the Silverſmith, and the Plumber? For, are not all the Matters they work in of too rigid and inflexible a Nature to yield to the Intentions of Painters and the Varieties of the Art of Drawing? Theſe Artiſts and a great many others were formerly confined to an uniform Practice. Every thing ſeemed to have been caſt in the ſame Mould, and indeed in a very coarſe one. But, what a Multitude of agreeable Forms are now aſſumed by a Wainſcot, a Cieling, a Door-Caſe, a Flower-Garden, a green Arbor, a large Vaſe, and an Inkſtand, a Support for a Pendulum-Clock, and even by a Snuff-box? Nay, Iron itſelf, which formerly afforded us nothing but Grates, Bars, and Doors for Priſons, does now comply with every Deſire of the Draughtſman. They make Incloſures and Fences of the Choirs of our Churches, of our Court-yards, and great Gardens, and of the Avenues of the loftieſt Buildings, which do not debar us from a full View of their whole Elegance, and are beſides a very great Ornament to them. There are no Works at preſent but what take Painting for their Guide, and become more pleaſing and commodious by complying with the Rules and Correctneſs of Drawing. Far then from looking upon Painters as a Claſs of Men unſerviceable to a State, their Art ſhall be eſteemed by us as the firſt Source of Neatneſs, of a delicate Taſte, and of that judicious Oeconomy, which Man is naturally inclined to introduce into whatever aſſumes a Form under his Hands.

But, laying aſide the many Helps, which all Arts borrow from Painting, towards being of greater Utility to us; let us now paſs on to what it chiefly propoſes to execute by itſelf.

Moſt commonly the Object of Painters, that of the Lovers of their Art, and that of the Art itſelf, are three very different Things. The Aim of ſuch and ſuch a Painter in particular is to grow rich by indulging the predominant

Taſte, and they would fain excuſe themſelves by alledging our Fondneſs for Trifles. Thence that Crowd of *Vattauz* * now pouring in upon us; thence that Multitude of Colombines † and Harlequins, of Attitudes and Geſticulations ſo indifferently uſeful.

The Lovers of the Art aim at ſomething elſe. Knowing the Hiſtory of the different Schools, the Hiſtory of each Painter, and even that of every individual Picture, is the chief Purpoſe of their Reſearches. Theſe may be excellent, when reſtrained within certain Bounds. Doubtleſs, there is a moſt real Delicacy of Judgment and Choice to be acquired by a frequent Compariſon of the different national Styles, by the Diſcernment of the various Talents of the great Maſters, and I muſt add, by the Knowledge of the real Faults to be obſerved in the moſt exquiſite Productions.

But, has not the Science in Point of diſcerning Pictures been clogged with a World of Reſearches and Facts utterly foreign to Painting? For my Part, I ſhall never envy a Connoiſſeur in the broking Way, his having found out through how many and what Hands a holy Family has paſt ſince it came from the Eaſel of *Leonard de Vinci* or *Annibal Carache*. I ſhall never read *Vaſari*, *Felibien*, or any other Compilers of the Lives of Painters, in order to know what the Shape of *Paul Veroneſe*'s Cap was, or with what Plainneſs *Pouſſin* re-conducted to the Door his Viſitors, even Cardinals, with a Lamp in his Hand. I own that all theſe Facts, though little connected with the Art of Painting, would nevertheleſs conſtitute a uſeful Kind of Learning, did they but aim at inſpiring young Painters with a Love of good Manners and Conduct, or at filling them with great Sentiments, and uſeful Thoughts concerning their own Art. But the Matter of theſe Recitals is nearly as trifling and inſignificant as the Notes and Notules with which *Bayle* has crammed and often ſtained his Dictionary.

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* A famous Groupe of ſmall Figures.

† The two chief Actors of the Italian Comedy, whoſe Pictures are often ſeen in Watteau's Works.

I know a Tradeſman in the *Fauxbourg St. Germain* who can recount every Thing with a good Grace, and ſet off the leaſt Trifle by his pleaſant Delivery. Coming home at Night, he writes upon little Scraps of Paper all the tittle-tattle Stories of his Neighbourhood, and as many of the Quarters thereabouts as he has been able to collect in his Ramble from one Coffee-Houſe to another; and from the *Palais Royal* to the *Tuilleries*. He ranges theſe Papers, and pins them up to his Tapeſtry, that he may be able, the next Morning, conveniently to repeat them as he is dreſſing to go out. The whole Afternoon is employed in delivering out and retailing his Stock of pretty Stories, among a Set of other Idlers who pay him in his own Coin. Our Tell-tale returns home at Night, loaded with Applauſe and new Collections. Should he ever take it into his Head to publiſh his Scribble under the Title of *City Anecdotes*, the Book will prove nearly as edifying and as material as *Bayle*'s Erudition, and all the pictoreſque Anecdotes.

The Glory of the Lovers of Painting.

The Lovers of this noble Art would carry it to its higheſt Degree of Perfection, and have the Pleaſure of putting a Stop to all the Whims of Painters, and the Glory of refining even the Taſte of the Public, would they but recall Painting to its true and primitive Practice, which conſiſts in acquainting us with the Particulars of natural Hiſtory, and the fineſt Strokes of the Hiſtory of Mankind; that is, in never offering any Thing to our Eyes but with a Deſign to teach us ſome profitable Truth in an agreeable Manner.

'Tis true, you will, for a Mrs. *Merin*, or a Mrs. *Baſſeport* (both of which have worked upon natural Hiſtory with equal Truth, Delicacy, and Nobleneſs) you will, I ſay, meet with hundreds of Painters of Flowers, who never ceaſe to disfigure Nature, by obſtinately painting it in the *Chineſe* Style; or who aim at no other Merit than that of knitting up a Noſegay or hanging up a Garland, without ſo much as minding the Veriſimility of Seaſons, putting together Grapes and Strawberries, Tulips and Amaranthuſes, which Nature never ſhewed us in Company. For two Pencils that have here and there delineated a few hiſtorical

Strokes, we ſhall find Thouſands that have been dipt conſtantly in the Dirt of Fables and the Filth of Idolatry. But we have at Hand a ſure Means of remedying the Scarcity we are in as to hiſtorical Pictures. Divine Providence, by adding to its many Bounties to Mankind the rich Preſent of the Art of Engraving, has ſhewed us a Method for multiplying by thouſands Monuments and Inſtructions which we formerly were obliged to ſeek for in one ſingle Place. But there reigns in that fine Art a Diſorder which the judicious Part of Mankind have always longed to ſee remedied. So long as Painters and Engravers ſhall work ſeparately and at random, they will follow the Attractives of Gain, and we ſhall never have any hiſtorical Series. The ſcandalous and the trifling will always hold the firſt Rank. But when ſuch of our Lords and rich People as are fond of Painting ſhall love it after the Manner of generous Men, and for the public Good, it will from that Moment become an eaſy Matter for them to lay all paſt Events before our Eyes, by making the Fortune of Draughtſmen and Engravers. Nay, they will do ſomething more. They will perpetuate great Draughtſmen, and illuſtrious Engravers among us. The Public has long ago loſt *Nantueil*, *Sadeler*, *Peſne*, *Gerard*, *Audran*, *Edelink*, and *le Clerc*, We are going to loſe *Dorigny*. The greateſt Names eſcape from us, and it would be in our Power to ſee them replaced.

The Lovers of the Art will find the Idea and Model of what they might do in this Kind, in *the Society for the Encouragement of Learning* that was eſtabliſhed at *London* ſome Years ago. Several of the Nobility, the Lord Chancellor and many learned rich Men, being above ſixty in Number, have united into a Kind of Academy, that has its regular weekly Meetings. They began by depoſiting in a common Purſe twelve Guineas each, adding two more from Year to Year. This Advance, which is nothing for People in good Circumſtances and fond of Learning, forms a ſtanding Fund, which is rather increaſed than diminiſhed. The Intention of the Society is to encourage the Works of the Learned, both in *England* and abroad, by printing the Editions of their Works, and by inſuring to them the greateſt Profits that can poſſibly be reaped from them. Any Works offered them, in whatſoever Language it may be written, is previouſly examined by a Committee, capable of judging of it. If the Work is, upon their Report, judged by the Society to be fit to improve any Branch of Learning, and uſeful to Mankind, all proper Regard being had to Religion, the Prince, and their Neighbour, they have it printed immediately, and charge a Bookſeller with the Sale. The Charges of the Edition are previouſly deducted, and the Reſt is faithfully delivered into the Hands of the Author, let him be in what Country he will. There is no other Scheme but that of an Aſſociation of this Nature, that can procure the Public what they have been ſo much longing for, I mean, a Collection of Cuts containing the moſt curious Facts, the Practices neceſſary to be known for the Underſtanding of the ſaid Facts, and finally the Inventions of every Kind which we have any Intereſt to promote and improve. Every one is preſently ſenſible, that this is the only Means of pleaſing every Genius, of rouſing even the dulleſt of them, and of inſtructing them all by alluring their Eyes, which never fail diſtinctly and gladly to catch at the Meaning of a Figure. Collections of this Kind, directed by learned Men mindful of the real Wants of the Public, and thoroughly verſed in the Knowledge of the human Heart, would be in Requeſt among Men of all Conditions, and bought in all Seminaries where young People are educated, in every Drawing School. A Collection of Cuts managed in this Manner, and executed by our greateſt Maſters, would be underſtood in all Languages, and appear to all the World what it in Reality is, *an Inſtrument which no Man ought to be without*.

Ingraving, which may be rendered the moſt inſtructive as well as the moſt amuſing of all Arts, puts the Buyer but to little Expence, and requires but a ſmall Apparatus on the Part of the Artiſt. Doubtleſs he muſt be a great Draughtſman to arrive at a high Reputation. But one of a middling Skill; a Lady who has a natural Taſte of Grace and Propriety; a Solitary that would beſtow his leiſure Hours upon a profitable Amuſement, might make no ſmall Progreſs in this Art, from the very Faculties it ſupplies thoſe with who cultivate it.

Ingraving in Wood.

After many Trials of the ſeveral Matters fit to receive the Graver, Wood and Copper have at laſt been fixed upon. The Manner of ingraving on Wood is the Reverſe of that of ingraving on Copper. In the Former, all the Strokes, which are to take Ink and be printed, are in Relievo, whilſt the Part, which muſt remain white, is chiſeled and ſunk that it may take no Ink. In the Latter, all the Strokes which are to take Ink in the Print muſt be ſunk, and all the Surfaces, deſigned to be white and without Strokes, remain elevated. The Wiping of the whole Plate removes the Ink from the ſmooth Surfaces, and the Paper applied to it under a Preſs ſinks a ſmall Matter into the hollow Strokes, into which the Preſs drives it without Reſiſtance; ſo that it takes off and remains ſtained with the Ink or any other Colouring it meets there.

Ingraving in Copper.

The ingraving in Wood ſerves for Borders, initial Letters, and all the Figures which are at the ſame Pull printed with common Letters. It was uſual in the ſixteenth Century to ingrave on Wood, and without much Coſt, very long Hiſtories; and although theſe Figures were but Lineaments and Contours without Shades, ſome of them proved exquiſitely fine, and are ſtill in great Requeſt for the Boldneſs and Freedom of the Drawing. This Manner might be purſued with ſome Profit, to help on the Education of Youth, without much inhancing the Price of Books.

Ingraving with the Graver.

The ingraving on Copper is executed three different Ways, *viz.* with the Graver, with Aqua-fortis, and in Mezzotinto. The Inſtruments for the Firſt are a Plate of Copper burniſhed; a Cuſhion for the Copper to lie on; a Point or Needle in a Haſt, and rounded at the Point; a Graver, which is a ſhort Rod of Steel with four Sides, whoſe Extremity is ſmoothed obliquely in Form of a Lozenge, to cut the Copper and open it more or leſs with the two Sides which are divergent from the Point. A round Graver, which is a Needle in a Haſt, and obliquely ground into an oval Form at the Point, to widen the Strokes without hollowing the Middle of them. A Burniſher, which is an iron Rod ending like a protracted Heart, to be rubbed and ſtrongly preſſed upon the Copper, when any of the Strokes are to be ſcraped out. A Scraper, which is another Piece of Steel of a pyramidal Form, having three Surfaces throughout, and ending in a Point, to ſcrape off all the minute Strokes and Roughneſſes of the Copper which the Point of the Graver may chance to leave in its Motion; and finally a Whet-ſtone to keep the Graver of a proper Sharpneſs.

Theſe are very ſimple Tools for an Art productive of ſo many Beauties; nor is there leſs Simplicity in the Graving itſelf. It conſiſts of three Operations, *viz.* Tracing, Sketching, and Finiſhing. 1. After having ſlightly rubbed with white Wax the Copper to be ingraved, and reddened all over with Oker the back Part of the Drawing or Print to be imitated, they trace, that is the Paper, printed or figured on one Side, and reddened on the other, being clapt and fix'd upon the Copper, they with a blunt Point paſs over all the Strokes and Out lines of the Figures; by which Operation they imprint on the Wax ſo many ſmall red Strokes conſiſting of the Particles which the Preſſure of the Point has taken off the red Lead, and which the Wax has retained by its Tenacity. 2. With a ſharp Point, they cut the Wax in all the red Strokes left on it, ſo as to make a ſlight Impreſſion on the Copper, which is called Sketching: 3. They finiſh, by widening the Strokes with the ſquare Graver, croſſing them at Diſcretion with the lozenged Graver. The greateſt Skill of the Artiſt lies in this third Operation. A little Aſſurance and Neatneſs ſuffice for the two former; but none but a true Genius can feel and produce the Effects of the latter.

Ingraving with Aqua fortis.

The Generality of Artiſts find their Account in the Ingraving with Aqua fortis; but this Method, which is a Help to Men of common Capacity, produces Wonders in the Hands of a good Genius, whoſe Fire exerts itſelf in it with more Freedom, as it is not ſlackened by the Reſiſtance of the

Copper. The above-named Inſtruments ſerve in this ſecond Kind of ingraving. The Operations peculiar to it are as follow: The Copper is ſmeared over with a different Matter: Inſtead of white Wax they uſe a kind of Varniſh in Balls, compoſed of Pitch or Turpentine, of *Turky* Reſin and Nut-Oil. After having burniſhed and well heated the Copper, they melt the Varniſh upon it, ſo as that a ſlight and even Lay of it may ſpread over a whole Side, by help of a ſmall Cuſhion of Cotton and Silk. This Copper-Plate, horizontally ſuſpended with its varniſhed Surface downwards, is black'd equally all over with the thick Smoak of ſeveral Pieces of large Wax-Candle burning at once. After this Apparatus, they trace the Deſign as in the ingraving with the Burin or Graver; and then, with rounded Points and round Gravers of ſeveral Sizes, they groove the Wax from all the Strokes, and ſhew the naked Copper there. It remains exactly covered with Varniſh every where elſe. Having next raiſed all round the Brinks of this Plate a ſmall Rampart of red Sealing-Wax, which forms a kind of Baſon fit to receive a Liquor, they pour into it a reaſonable Quantity of Aqua fortis, which is tempered in ſome Caſes with a Mixture of common Water. Aqua fortis has the Property to corrode or diſſolve moſt Metals, and Copper eſpecially; but it cannot prey upon fat or unctuous Bodies, ſuch as Tallow, Pitch, and Wax. The Engraver eats and drinks, ſleeps and goes out about his Buſineſs, while the Ingraving goes on; but he is mindful of the Time when the cauſtic Liquor might do him more Work than he ſhould approve of. He then looks about him; takes the Aqua-fortis timely away; and if he has a Mind to ſpare ſome of the naked Parts of his Copper more than the reſt, he preſerves them with a Compoſition of Aſphaltum and white Wax, or of ſome other unctuous Juices, and lets the Water ſtill prey upon the Strokes that want to be made deeper. After he has melted all the Varniſh upon a gentle Fire, and wiped the Plate clean, he cloſely ſtudies and ſearches every Stroke or Line; firſt with the Scraper, then with the round Graver and the Burin. He widens, enlivens, ſinks, rounds, ſtrengthens, or ſoftens the Strokes, ſo as to reform the Incorrectneſs of the Aqua fortis every where.

The moſt finiſhed Pieces, and thoſe that have a determined Shape in Nature, are more exactly rendered by the Ingraving made with the Burin than by this ſecond Method. For, although you can perceive no Cuts or Etchings upon the Contours of a Face, an Arm, or a fine Flower; a ſkilful Hand cuts the Copper with Strokes ſo exactly diſtant from each other, ſo gracefully contoured, ſtrengthened or ſoftened ſo properly, that, if you remove the Picture to ever ſo little a Diſtance, the Eye ſees no longer any Thing but Lights ſet off by all the gradual Tones of the Shade; nothing in ſhort but a Figure perfectly like its Original in every Reſpect. The Aqua-fortis, both in its Operations, and the Corrections it requires, multiplies the Strokes, and multiplies Scratchings and Notches upon Surfaces, whoſe Lines muſt be neither hard nor confuſed: But the Ingraving with Aqua-fortis has Advantages which procure it the Preference in a great many Caſes. There are in Nature a Multitude of Parts to be treated very differently from the human Figure. The Air and all the Meteors, the Earth and all its Unevenneſſes, the Verdure of Meadows and the Foliages of Foreſts, the Skins of Animals, and moſt of Man's Works, are charged with ſuch an amazing Detail of minute Strokes, that the Graver cannot ſuffice to expreſs them; whereas the Aqua-fortis facilitates the Repreſentation of them, by the very Oddneſs of its Corrodings.

The Ingraving in Mezzo-tinto is ſtill eaſier than the two foregoing; but the ſame exquiſite Taſte is neceſſary to execute it in an excellent Manner. They begin by charging every Way with ſmall Strokes the Plate of Copper intended to be uſed. This firſt Work is done with a ſmall Steel Shovel three Inches wide, and ſomewhat round at its Extremity in the Form of a Cradle, which made it go by that Name. Of the two Lines which terminate the Thickneſs of it, one is ſharp and cutting, the other is briſtling with ſmall Teeth ſeparated by a Furrow which the Thickneſs of a Sheet of Paper might fill. They direct this Tool from the Top to the Bottom, reſting upon the whole-Plate of Copper, and then from the Right to the Left, which covers it all over with ſmall Squares. Then they croſs all theſe Squares ſeveral Ways with diagonal Lines ; ſo that, if you ſhould blacken it with Ink and print a Paper of it, it would only prove a kind of black Velvet. After this ſo very eaſy Apparatus, they draw the Deſign upon it as in the ingraving with Aqua-fortis ; but they do not cut the Out-lines of the Figure with the Burin. They finiſh the Work with ſmall Steel Sciſſars, ſhelving at the lower End, and terminated ſome by an horizontal Edge, others by an oblique one, or forming a Variety of Angles for all Occaſions. Theſe Sciſſars ſerve to cut off, or more or leſs blot out the blackeſt Velvet-Colour, in order to have more or leſs white Surface, and to weaken the reſt of the Black by ſeveral Gradations, in order to have the Contours and Shades. This is ſomething like what happens when you blacken upon a white Wall with a Coal, a Square, or an Oval of ſome Extent, and with your Thumb wipe off ſlightly in part, or intirely the Black in ſuch Manner that the White Part, appearing again by little and little, may fill up the Space of a Forehead, a Noſe, a Cheek, or a Chin, and be more or leſs ſet off by the Proximity of the Shades ; there reſults from hence a Face or a great Medal ; that's the Sum Total of the Art of ingraving in Mezzo-tinto

Ingraving in general has an eſſential Defect in it ; it has only black and white to diſtinguiſh Objects. The Ground of its Varieties conſiſts in the relative Diminutions of the Lights and Shades. A new Method is now advertiſed (*a*) to remedy this Inconveniency, by printing at ſeveral Times, ſo as to turn an ingraved Piece into a true Picture by matching ſeveral Kinds of Ink together. Could this Invention but ſucceed, it would bring forth more Pictures from the Preſs in one Day, than the moſt ſkilful Pencil could afford in a great Number of Years.

Notwithſtanding the vaſt Eſteem I have for the Works of Poets and Muſicians, of Painters and Ingravers, I would fain ſtile them ſeducing Arts. There is no leaving

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(a) Paris, at Mr. Gautier Rue St. Nicaiſe.

of them; and if we do not moderate both our Liking to, and the Time we beſtow on them, the Superiority of their Charms and Splendor will ruin, not indeed the real Merit of other Talents, but the Eſteem they juſtly deſerve from us. Let us now paſs on to the fineſt Inventions that have promoted the Progreſs of thoſe very Arts we have been ſpeaking of, and procured numberleſs Inſtructions of all Sorts to Mankind. Such are the making of Paper, Printing, the Hammer and Fly of the Minters, the Art of caſting Letters, Bells, Organ-pipes, and large Figures in Braſs; by all which, Monuments and the moſt agreeable Means of Communication and Inſtruction are perpetuated.

DIALOGUE XIX.

A Second Sequel *of the* Arts *that give us* Instruction.

We ſtill preſerve among us the Signs primitively inſtituted to publiſh the Introduction of a Solemnity, to fix a March, a general Sale, or any other Operation common to a whole People. Theſe Signs ſpoke to either the Ears or the Eyes. Such were the ſeveral Sounds of the Trumpet, or the various Ways of beating the Drum. Such were a Pair of Colours or Foliages expoſed at the Top of a Tent, a Crown of Verdure, the Figure of a Serpent, a Dragon, an Eagle, or any other Animal carried on a Pole.

Theſe Figures were of themſelves inſignificant; but the Meaning affixed to them was agreed upon. Other Methods were afterwards invented of tranſmitting the Knowledge of certain Things to the Abſent, and even of handing them down to Poſterity. Such were the Stones placed at Diſtances to direct Roads, or fix the Bounds of Fields. Such were the Columns, the Trophies, the

Arms hanged up on the Trunk of an Oak, and all the Monuments ſet upon ſuch Places as were become famous by ſome great Event. Such were all thoſe Symbols ſo much uſed in Antiquity, which ranged them in Order, and made them their firſt Writing (a).

Painting and Sculpture were appropriated afterwards to repreſent Objects that were not enigmatical, and to give the Mind to underſtand the ſame Things as appeared before the Eyes. This Method of inſtructing was the better received, as it required no Maſter, nor any Effort of the Mind or Memory to make it underſtood.

But the Meaning of all theſe Signs was very much confined; and a great deal of Expence and Apparatus was often neceſſary to intimate but a few Things. Much Eaſe was procured, and a large Field opened at laſt, by the Invention of the Characters which repreſent the Articulations of the human Voice. For theſe Articulations, though not many in Number, are ſufficient for us to expreſs any Thing by: Whence of Courſe it happened, that the few Letters we have, to paint our Sounds, are likewiſe ſufficient to repreſent and convey unto the Mind any Meaning whatever.

Theſe Characters, as well as a great Number of the Figures, which had heretofore ſerved as Signs, were ingraved, and hollowed out, ſometimes cut in Relievo on Stone, on the ſofter Metals, on Slate, Wood, and Table-Books, done over with Wax.

Liber, philyra, a fine Bark.

They afterwards recurred, for greater Eaſe, to the *Libri*, that is, to the fine Barks that may be taken off the inner Cortex of Trees, and which are by Nature prepared, one upon the other, to thicken ſucceſſively from Year to Year, whereby a new Circle is regularly added to the Maſs of the Tree. Theſe ſlight Barks were ſometimes cut into ſmall oblong Squares, and then tied together by one of their Sides, and laid Face to Face, as we ſtill diſpoſe the Leaves of our Books. They frequently were paſted and tacked together, wherewith they formed a narrow, but very long Band, the Extremities of which they faſtened to a Couple of Rollers, and as much of it as was unrolled on one Side, ſo much was rolled up again on the other, to the End that you might have before your Eyes the Place where the Lines you wanted to read were written. The Length of the Lines was proportioned to the Breadth of the Roller.

(a) See the firſt Writing of Mankind. Hiſtory of the Heavens. Part I.

This Method of Writing not being very durable, it was advantageouſly replaced by the Uſe of Membranes, that is, of Buck and Sheep-ſkins, which were, by proper Dreſſing, rendered extremely ſmooth and tough; beſides the Conveniency of the Whiteneſs, they had the additional Merit of a long Duration. The Kings of *Pergamus*, who brought this ancient Way of Writing very much in Vogue, cauſed theſe Membranes to be called by the Name of *Pergamena*, which was altered ſince, and corrupted into that of Parchment.

Membrana.
Pergamenum.

They ſlightly delineated the Figures of the Sounds of the human Voice upon the above-mentioned Barks or Parchment, with ſome coloured Liquor fit to ſtrike againſt the Colour of the Membrane, and with a Reed cut ſloping into a Point, and having a ſmall Notch in that Point to divide it into two, that the Liquor might flow. The largeſt Feathers of Birds, the Inſide of which is ſmoother, and the Matter pliant, though not brittle, have, by Degrees, taken the Place of Reeds intirely.

The Skins, fit to write upon, proved inſufficient, on account of their ſmall Quantity, to ſupply all the Wants of Man, and write down the Thoughts of the Learned. Nothing was found eaſier to be procured, or more convenient in every Reſpect, than the inward Membranes of a Rind of Ruſh, that grow on the Banks of the Places where the Overflowings of the *Nile* terminate. This Plant went in the Eaſt by the Name of *Paper*, (a).

The Matter of theſe Barks being very brittle, they ſtrengthened them by paſting them, ſometimes one ſingle Piece upon another, ſometimes ſeveral Pieces upon others, taking Care to keep the Fibres of one Layer one Way; as for Inſtance, from above downwards, and thoſe of another,

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(a) Papyrus. See Plinian exercit. Salmaſ. in Solin. Vol. ii. Page 1003, Pariſ. 1629.

another Way, as from the Left to the Right (*a*). After they had thus paſted two or threefold the ſeveral Strata of Barks, wherewith to make a Sheet of ſome Subſtance, the two Surfaces of them were done over with a very fine Paſte, that filled up all the Vacancies, to hinder the Ink from ſinking and ſpoiling the Characters. When they had a Mind to render a Book made of theſe *Egyptian* Paſte-boards more durable, they gave it a Body, and a ſtill greater Firmneſs, which has preſerved ſome of them to our very days. Such is the Collection of the Letters of St. *Auſtin* upon *Egyptian* Paper, which is as yet ſeen in very good Condition in the Library of St. *Germain des Pres*.

The Origin of the Words Carte, Carton, Paper, Livre, Bible.

The Names of *Carte* and *Carton*, that were given theſe Sheets of Bark paſted together, have been, and are ſtill, conſtantly given to all thoſe which are likewiſe made of ſeveral Matters, applied and paſted one upon another. The Word *Paper*, which meant properly that Kind of *Egyptian* Ruſh, whoſe inward Barks ſerved to make the Sheet of Books, has been, without any Interruption, the Name of the Sheet we write upon, thought of a very different Nature. The Word *Bible*, originally uſed, as well as the Word *Livre* to expreſs the fineſt Bark of Plants, is found again in that of *Bibliotheque*; and, when alone, it ſignifies the *Livre par Excellence*, the Holy Scripture.

The *Egyptian* Paper, univerſally uſed in all Places about the *Mediterranean*, becauſe it facilitated the Importations of it, was long the greateſt Riches of *Alexandria*, and, by its gradual Decay, cauſed afterwards the Ruin of that wealthy Town, now almoſt reduced to nothing. It began to be leſs uſed in the eighth and ninth Centuries, and was at laſt intirely laid aſide, by the Introduction of a more ſubſtantial Paper. It is that which was then made with Cotton bruiſed ſmall, and reduced to a Paſte, and then dried in Moulds, where it aſſumed the Conſiſtence of a ſlight Sheet of Felt.

Cotton-Paper. Carta cottonea, Goſſipina, bombycina, bombycea.

(a) Juſt as the Sticks of a Hurdle are diſpoſed, tranverſa crates peragitur. Plin. Hiſt. Nat. lib. 13. cap. 11.

But the *Europeans*, who had not the Matter of this Paper, and ſent very large Sums of Money into *Aſia*, in Exchange of ſo uſeful a Commodity, tried to make, with their Flax and Hemp, a kind of Paper equal in Goodneſs to that made in the Eaſt, with the ſhort and weak Threads of the Huſk of the Cotton Tree. The Filaments of their Line and Hemp appeared untractable to them at firſt, by their exceſſive Length and Hardneſs. But they at laſt found, that when they had been uſed in Cloth, and rendered ſupple by wearing, they were perfectly triturable. A kind of Paper was at laſt made of them, that was no otherwiſe inferior to Parchment than in Point of Strength, and was ſuperior to all the foregoing in point of Whiteneſs. A happy Diſcovery this; which rendered Books more durable by the Goodneſs of the Matter; more eaſy to be multiplied on account of their cheap Price; and more legible by the Oppoſition of Colours. Next to the Advantage reaped from it by the Sciences, let us not forget mentioningthe Benefit accruing from it to *Europe* in particular. The Invention of Rag-paper brought among us this important Branch of Commerce, about the thirteenth and fourteenth Centuries, when all the Libraries began to be furniſhed with it; nor was the immenſe Matter of it ſupplied otherwiſe than with a Rifraff, whoſe perfect Uſeleſneſs cauſed it to be thrown away with other Sweepings.

The Manner of making of Paper.

As the Cloth is coarſe, fine, or middling, the Rags coming out of it make Paper of different Degrees of Goodneſs. They begin by collecting the Rags, and even pick up thoſe that are flung into the Street. Theſe Rags are heaped up, and put into a Place for mellowing When ſufficiently macerated by the Water, they are made to paſs through the firſt *Pile*, which is a large Mortar, lined with an iron Plate, wherein they are maſhed, by the alternate Falling of ſeveral large iron Mallets.

The firſt Pile.

The ſecond Pile.

This Paſte, thus maſhed, is put into the ſecond Pile. There it is beaten ſo as to change its Colour, and ſhew a firſt Shade of Whiteneſs. Thence it is put into wooden Bins, where it it dries leiſurely; and then it is laid up in Reſerve to be uſed as Need requires.

The third, or working Pile.

When they have a Mind to work the Paſte, they give it its laſt Conſiſtence under wooden Mallets, that maſh it again in a third Mortar, called the working Pile. It paſſes thence into a Vat of clean lukewarm Water, where it is ſtirred ſeveral Times, that the Water may ſoak the whole Maſs equally. The Paſte is then fit for Uſe, and only wants being caſt in the Mould.

The Mould, or Form.

The Mould, which is to form the Sheet, by giving it its proper Width, Length, and Thickneſs, is a wooden Frame, filled within by a Platform of braſs Wires well ſtretched out, cloſe to each other, and divided into equal Portions by ſo many other ſomewhat bigger Wires. There riſes above this ſmall Hurdle, and commonly in two Places, a kind of Filligreen, or Net-work, of Braſs or Silver, wherewith to imprint on the Sheet the peculiar Mark of the Manufacturer, and what ſerves to ſhew the Degree of Goodneſs of each Kind of Paper. One is marked with a Bell, and is called Bell-Paper, another has Grapes, or any other the like Figure.

The Mould, great or ſmall, ſuch as we have juſt deſcribed it, is dipt in the Vat, whence it carries away what Quantity of this white Paſte it can hold upon its Bottom. What happens to be ſtopt upon the Borders of the Frame falls off into the Vat, by inclining the ſaid Frame. The whole Moiſture of what fills the Bottom runs out through the ſmall Intervals of the Braſs Wires. The thickeſt Part, which is an Heap of Filaments, promiſcuouſly and every Way complicated one with another under the Hammers and Mallets, is laid hold of and ſtopt by the Wire-Sieve: and this Matter, which but an Inſtant before was a Fluid, has by that very Fluidity been diſpoſed to ſink to the Bottom perfectly level. It ſinks a ſmall Matter, and thus finds its proper Thickneſs in the exceeding of the Borders of the Frame above the Bottom, in which State it can no longer be called Rags or Lint. The ſudden Draining of all Moiſture has made a ſolid Body, a ſmooth Maſs, a little well compacted Felt perfectly even It is a Sheet of Paper.

The Coucher.

The Dipper.

A Workman, called the Coucher, receives it with its Frame from the Hands of the Dipper. He turns the Frame upſide-down, and makes the Sheet fall upon a Piece of Felt, or of Stuff, ſpread on purpoſe to receive it: Then he covers it with a like Piece of Stuff The Dipper, however, has by this Time dipt another Frame into the Vat, and he, at receiving back the firſt Mould, delivers a ſecond Sheet into the Hands of the Coucher, who lays it flat, and covers it as before. Thus they go on, one with Dipping, the other with Couching. When this Heap of alternate Pieces of Stuff and Sheets of Paper is arrived at the requiſite Perfection, it is put into the Preſs to ſqueeze out, and turn into Water all the Moiſture diſperſed in the Body of every Sheet.

The Layer.

Then comes the Layer, who raiſes the Sheets, and lays them flat upon a large ſquare Board, called the Layboard, where the Air increaſes their Strength, by drying them more and more. They are put in the Preſs a ſecond Time, and dried anew upon Lines.

The Foreman, who is at the Head of the Place where the Paper is fixed, boils for ſixteen Hours together a kind of Glue made with leather Shavings, and chiefly with Bits and Scraps of Parchment, with a little Allum: He then filtrates it through a Straining-bag, and keeps it clear and lukewarm in a large Copper Kettle. The Sheets are dipt into it, then put in the Preſs again, to force this ſize into the largeſt Pores and Cavities of the Paper, and throw the ſuperfluous Part of the Size out of the Heap of Sheets preſſed down. The Reſult of this important Operation is its hindering the Paper from *ſinking*; a Fault it is liable to, when wet with any Liquor, or not ſufficiently ſized. It is the Nature of Fluids in Contact, to have a Tendency to mix together by equal Portions. Whence it happens that Ink, at its coming upon a moiſt Paper, ſtrives to ſpread equally around in the Fluid or Moiſture it meets there. The Caſe is ſtill worſe, when there are Spaces, greater or leſs which happen

Pen to remain between the Fibres of the Rags, where the Ink will infallibly ſpread, when they have not been exactly filled with Size.

The Drying Loft.

From the Preſs the Sized Sheets are carried to the Drying Loſt, whence they are put in the Preſs again. Then they are gathered in order to caſt out thoſe that are defective. The good ones are ſmoothed with a Stone ſlightly rubbed with Mutton-fat, and then folded into two and gathered by twenty-four, which make up the *Quire*. All the Quires piled up are again put in the Preſs to have their rougheſt Extremities ſhaved off. They are ſometimes cut exactly ſmooth, as it is uſual for Poſt paper and Books of Accompts.

The Quire of Paper.

Twenty of theſe Quires put together, packt up with coarſe Paper and Packthread, make what they call a *Ream*. The Paper, laid up in Reams, is put a ſixth and laſt Time in the Preſs, and then all is done.

The Ream.

Writing.

Writing, of which Paper is the common Inſtrument and one of the beſt Means for us to communicate our Knowledge and Thoughts to each other, is performed in four different Manners.

Current Writing.

1. They uſe the Pen and Ink, or any other coloured Liquor; which is called current Writing.

Opened Characters.

2. One may write with Types of Pewter, Lead, or Braſs, which, being perforated and applied to Paper, are made uſe of in drawing with a Pencil, and in what Colour you pleaſe, Figures agreeable to the Aperture of the Metal. This Writing, though long and tedious in the Practice, is nevertheleſs of ſome Value, on account of the very great Neatneſs it may procure in the Performance. We are obliged for it to the ancient Monks, who uſed to get their Livelihood by copying of Books. This Method was chiefly uſed for Title-pages and initial Letters.

3. They

Ingraving in Letter.

3. They uſe wooden Boards and Copper Laminas, commonly called Plates, (in French *Planches**) on which they delineated Letters or any other Figures which they thought fit; which brings us back to the Invention of Engraving. The Hammer of the Mint-men, the Signets and Seals are Proofs of the Antiquity of this kind of Writing; but they thought very late of adding the Help of the Ink and Preſs to them.

Printing.

4. The laſt Kind of Writing is that executed with moveable Characters, that is, with caſt Pegs or ſmall Laminas of Metal, terminated by Letters and other Marks in Relievo. Theſe Laminæ being ranged on a Frame, cloſe to each other, and offering to the Eye none but thoſe Figures in Relievo, receive only upon theſe Figures the thick clammy Ink they have been rubbed with. There is then a Neceſſity that they ſhould mark out no other Lines but the Strokes of theſe Characters on the Paper applied to them with a Preſs. This is what they call Printing.

This laſt Way of Writing both re-unites and ſurpaſſes the Utilities of the three others; for it offers to the Eye a more regular Character, and a better Body of Letter than that of the current Writing. It has, like the third method, the Conveniency of quickly multiplying Copies of the ſame Piece; and has, as well as the ſecond, the ineſtimable advantage of uſing Letters, which being afterwards ſeparated and laid up in Reſerve, will be uſed many Times over, and ſerve for printing Works perfectly diſſimilar.

The Art of Writing.

Every Age and Nation has its Way of Writing. The firſt Inſpection of all theſe different Letters cauſes the learning, or even the bare reading of them to be looked upon as a moſt difficult Taſk. The Whole is nevertheleſs ſo very ſimple and eaſy, that we ought not to deprive ourſelves either of the Facility of Writing tolerably, or of that of reading the Manuſcripts of the ſeveral Ages.

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* The ſame Word Planche is uſed in French for a Copper-Plate, and a Wooden Board.

The Neceſſity of Writing tolerable well.

The ſame Motives, that make us preſent ourſelves to our Species with Decency and an intelligible Language, engage us to ſtudy to arrive at a legible as well as a neat and well ordered Way of Writing. None but thoſe, who reſpect no-body, and think themſelves exempted from all Regards due to Society, can well neglect having a tolerable Hand-writing.

The Neceſſity of reading Manuſcripts.

As to the Manuſcripts and Inſcriptions of paſt Ages, no Law obliges us to read them and keep a Correſpondence with thoſe who lived before us. But, when deſtitute of this trifling Talent, we have at hand all Monuments, without being able to make ourſelves the wiſer for it. Our Fathers ſpeak to us a hundred different Ways; and we ſeem affectedly to avoid underſtanding them. We are forced to have Recourſe to the Eyes and Fidelity of others, in Things which frequently occur, and with regard to Intereſts in which Miſtakes are dangerous.

A Method for Writing well.

The Art of Writing runs on Principles level to any Capacity. Inſtead of beginning with learning how to ſhape the ſeveral Characters either of the old round Writing, or of the modern *Italian* Letter, or of the Running-hand, the Succeſs of which Method is very uncertain; there is a ſhorter, and generally a ſurer Way for any kind of Writings whatſoever, which conſiſts in accuſtoming the Hand for ſeveral Months together, to the making of the three Strokes, which are the Elements of all imaginable Characters. Theſe are the full Stroke, the Hair-ſtroke, and the mixed Stroke. The Thing is preſently underſtood by any Scholar. As to the Performance, it may be either brilliant or only tolerable. The former proceeds from a happy Diſpoſition, and a great Flexibility in the Joints of the Fingers. The tolerable and infallible Succeſs of the Performance depends upon the holding and cutting of the Pen, of which theſe elementary Strokes are the Effects. As ſoon as the Wriſt and Fingers are inured to this ſlight Exerciſe, all is done. In two or three Months Time, and often in leſs, and without having as yet attempted the ſhaping of any Letter, you are agreeably ſurprized to ſee the Hand at once effecting all the Characters you are pleaſed to demand of it, merely becauſe they are all compoſed of the three Strokes it has rendered familiar to itſelf.

A Means of accuſtoming oneſelf to Manuſcript.

Howſoever eaſy it may be to make for oneſelf in a little Time an Alphabet of the Writing of every Age, whereby to decypher all Sorts of Monuments, we actually want a Paleography, that is, a Collection of old Writings, that may be at Hand, and eaſily obtained. I thought myſelf obliged, my dear Friend, to procure you this Help, by ſending you ſhort Imitations of the Manuſcripts of every Age; becauſe, if we have not early Occaſions to take a Liking to them, we are in great Danger of enjoying this Advantage too late; and it is ſtill more common never to enjoy it at all.

As we are ſpeaking here only of the Diverſity of the Characters from one Age to another; it is perfectly indifferent to you whether I borrow my Samples from the *Latin* Tongue, or from the *French*, *Italian*, or other Manuſcripts. I ſhall perhaps have rendered them in one Reſpect more inviting to you, by chuſing them as much as lay in my Power among the Monuments of our Mother Tongue. Whilſt you ſhall ſee how Writing changes by tracing it back in Antiquity from Age to Age, it will perhaps be a Kind of Pleaſure to you to have as many Specimens of the Progreſs of our Language, and to obſerve by what Degrees it more and more ſwerves from our modern Tongue, till it loſes itſelf at laſt in the *Latin*, which is its principal Source. The Hiſtory of our Tongue not being as yet made, we may in this Manner make a Kind of preliminary Sketch of it to ourſelves.

DIALOGUE XX.

The French PALEOGRAPHY.

THE *French* Tongue, to the Monuments of which we may very well confine ourſelves, has from Age to Age changed its Writing and Turn. The Writing of the Beginning of the ſixteenth Century, and of the latter End of the fifteenth, when the Art of Printing was invented, is the moſt difficult of all, though the leaſt remote from our Age. The Inſcription, and even the Manuſcripts, become more and more legible as we go farther back. The latter of them becomes the ſame with that of Medals, and is not different from the ancient *Roman* Characters; as the *French* Language itſelf draws nearer and nearer the *Latin* Tongue from which it ſprang.

The *Romans* becoming Maſters of *Spain*, and the *Gauls*, introduced the *Latin* there; and the *Gauls* having, as well as the *Spaniſh*, been a great while Members of the Empire, forgot their peculiar Language entirely, (a) uſing no other than that of the *Romans*. Thus did *Latin* become the Mother of the *Spaniſh* and *French* Tongues. They reſpectively ſtill have Features that diſtinguiſh them; but a conſiderable Ground of Reſemblance cauſes them to be known again for Siſters. Let us follow the gradual Progreſs of our own. Several *Roman* Emperors reſided in the *Gauls*. Long before them, the *Roman* Armies, the Prefects of the *Gauls* and their Courts, had accuſtomed theſe Nations to the underſtanding of *Latin*, Law-Suits were pleaded and all public Acts written in that Language. It was the ſame with the Prayers of the Church and the Inſtructions in the fourth Century. Beſides, Eloquence and the *Roman* Literature had been long cultivated in the Schools of *Bourdeaux*, *Lyons*,

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(a) See Bernard Aldret, de Origin. Ling. Caſtellan.

Autun, *Beſançon*, and *Rheims*. There was ſuch an Emulation and good Succeſs there, that St. *Hierome* and other foreign Writers make very great Encomiums on them. *Cornelius Fronton*, an Orator of the ſecond Century, calls the School at *Rheims* by the Name of *New Athens* (a)

All Perſons liberally educated did then ſpeak *Latin*, and the common People underſtood it. Nay, the People themſelves ſpoke it at laſt, and even ſpoke no longer any other, as it was the only Language uſed in Commerce, and generally ſpoken both by the Heads of Families, among the *Gauls*, who had long ago been *Roman* Citizens, and by their Slaves, who had no peculiar Language of their own. But the Multitude altered the Purity of the *Roman* Tongue, either by conſtruing it wrong according to the Genius of their ancient *Gauliſh* Language, and the Gibberidge of their own Provinces; or by intermixing it with many Terms commonly uſed by the barbarous Nations who ſettled among them, or ſojourned long in the *Gauls*, or by neglecting, as theſe *Barbarians* did, the Regularity of Inflexions and Genders; or, in ſhort, by pronouncing the *Latin* Words ſo as to cauſe them to be miſtaken for another Language. Such are theſe Words, which we frequently find murdered, when written as they are pronounced; *Omnebs* for *Omnibus*, *uns* for *unus*, *bons* for *bonus*, *prevoire*, or *prevére*, for *Preſbyter*, *aorums* for *adoremus*, *Romans* for *Romanus*, &c.

In the like Manner the *Francs*, who mixed and diſperſed among the *Gauls*, of whom they were neither the Enemies nor the Conquerors (b), forgot their *Teutonic* or *German* Language. It was hardly uſed any where but at the Court of the Kings of *France*, becauſe they were of *German* Families, and the *Lingua Franca* could not be diſpenſed with, in ſuch Affairs as had any Relation to the Provinces about the River *Rhine*, where no other Language was ſpoken. But the *Francs*, in their learning the *Roman* Language with the *Gauls*, conformed

(a) Illæ Veſtræ Athenæ Durocortoro. See Notitia Orbis antiq. Chriſtoph. Cellar. Articul. Rhemi.

(b) See the Eſtabliſhment of the French Monarchy by Mr. Du Bos.

themſelves to the vulgar Uſe," without minding the Regularity of the *Latin*, being moſt of them military Men, and making no great Uſe of Letters.

Thus was formed the *Roman* vulgar Language, already uſed in the Time of the firſt Race of our Kings, among the Commonalty of the *Gauls* and *Francs*, who were become but one Nation under the Name of *François*. They even continued to call it *Sermo Romanus*, to diſtinguiſh it from the *Franc* or *German* Language, as well as from that of the *Goths* and *Bourguignons*, and from a Language, which a Nation obliged to leave *Great Britain* had brought into the moſt weſterly Province of *France*, now called *Bretagne*. The Accent, which raiſed the Pronounciation of the Penultima of Words, very often cauſed the Vowel of the laſt Syllable to be ſuppreſſed. Thus the *Sanctus Spiritus* was pronounced and wrote ſo as to cauſe the final *u* to vaniſh. They then pronounced *Sants Eſperits*, as is ſeen in all the ancient Symbols. Whence the Habit of calling the vulgar Language *Sermo Romans*, cauſed the Name of it be abridged into that of *Romans* or Romance. This laſt one fixes and preſerves the ancient Pronunciation of the other.

The Councils, which deſire the Paſtors to inſtruct their Congregations in that popular Language rather than in good regular *Latin* which was leſs underſtood by the Multitude, call it very frequently the *Roman* Ruſtic (a) or plainly the *Ruſtic*. Nay, the very *Latin* of the Man of Letters, accuſtomed to this vulgar *Jargon*, could not fail of being much influenced by it, in its Turns, Words and Terminations.

One is amazed at the Barbariſm which reigns throughout the Stile of the *Ripuarian* Laws, of the *Salic* Laws or Regulations of the *French* Tribes, called *Salic* Tribes, of which the Family then reigning was ; and in the ſet Forms of the Juriſprudence of the ſeventh and eighth Ages. A better Taſte ſtrove to revive under *Charlemagne* and his firſt Succeſſors, which decayed afterwards, and gradually fell with their Authority.

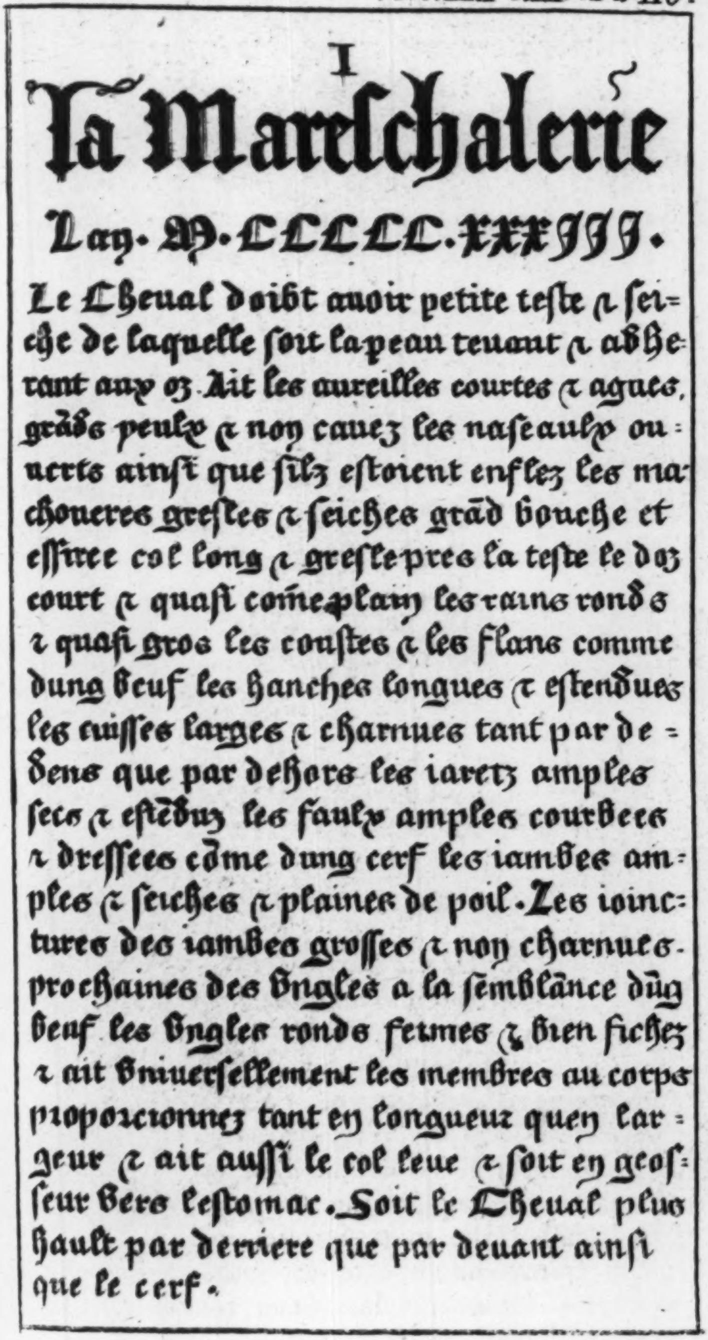
(a) See the Councils of Tours and Mentz in the ninth Century. See Fouchet, and the Preface of the Gloſſary of Du-Cange.

The Habit, which the Lords of Manors took in the tenth Century and the following, of deciding their own private Quarrels themſelves, and of making War againſt one another upon every Trifle, either in Company with their Vaſſals againſt thoſe of their Enemy, or in ſingle Combats; and the long Voyages and Travels, or *Cruſades* afterwards undertaken towards recovering the Holy Land, cauſed the Love for all Studies to be totally laid aſide, They, at theſe Times, looked upon the poor *Latin* which helped as yet a few People to underſtand the Prayers of the Church, and to write down the judicial Acts and Deeds, as a Kind of learned Language. But this *Latin*, no leſs barbarous though leſs energic than the Romance, had at laſt the ill Fate of not being ſpoken at all. It took its Refuge in the Schools, from whence a right Taſte has often tried to drive it, and where it has always endeavoured to keep itſelf up under the Shelter of Cuſtom. But being no longer underſtood by the Nobleman and Citizen, and much leſs by the Peaſant, the vulgar Language began to be much more uſed in Things relating to the Publick. It became more uſual than before for giving Inſtruction. The Cuſtom was introduced of writing in *Romans*; and they called *Romans*, or *Romance*, or *Romancier*, whatever was written in the vulgar Language, Proſe or Verſe. It was no Diſgrace to any Hiſtory or Sermon to ſay that they were written in *Romans*. It was the ſame as ſaying they were written *en François*; an Expreſſion that would not have been juſt in the Beginning of the Monarchy, when this laſt Word ſhould have ſignified, not indeed the vulgar Language of the *French*, but the old *Lingua Franca* or *German*, which they had ceaſed to ſpeak. The Chivalry-Tales, that were made purpoſely to amuſe the *Croiſes* when they had nothing to do, being well received every where, the *Romans*, in its Turn took more Favour than ever. They talked of nothing but reading or writing the *Romans*, which ſignified a Love for the reading or compoſing *French* Books. Theſe Books, full moſt of them of imaginary Adventures, proved acceptable from the very Facility of underſtanding them, and from a Reſult of their Conformity with all the Diſorders of the human Heart.

This is the ſhorteſt Summary that can poſſibly be given of the Birth and Progreſs of our Language. Let us now come to the ſeveral Writings that have tranſmitted the Monuments of it to us. Here we may either come from the earlieſt Times of the Monarchy down to our preſent Age, or begin by the Manuſcripts of the latter Ages, and go back afterwards to thoſe of the foregoing. This laſt Proceeding ſeems the more commodious, as the Language of the Monuments, connected with the latter Age, is leſs remote from our Uſage than what went before, and does nevertheleſs ſympathiſe with what is immediately above it, enough to give an Inſight into it. Thus does every Age facilitate Acceſs to the foregoing. We gradually arrive to the very Time when our *French* is hardly to be known, and could never be underſtood with this Introduction. This Order is neceſſary to help us to underſtand what is written in our Language, nor does it in the leaſt prejudice the Reading of what is written in another; the *French*, *Provincial*, *Gaſcoon*, *Caſtilian*, and *Italian* Languages having no other Characters than the *Latin*, which gave Birth to them all.

The WRITING *and* LANGUAGE *of the* XVI *and* XV CENTURIES.

I. THE Monuments of the Writing which is called *Gothic* (in Engliſh *the Black Letter*) and which ought to be called *German*, are, as well as thoſe of the Language of the ſixteenth Century, ſo numerous, and offer themſelves ſo frequently to every Eye, that one or two Samples will be fully ſufficient here. This Character, eſpecially the large one, which is that of the Inſcriptions, is in Reality very regular, ſince it agrees with the principal Effects of the Pen well cut and held. But, for want of adding to the full and the Hair ſtrokes that which is called the mixt Stroke, in order to ſmooth the Paſſage from the one to the other by a graceful Rounding; this Character has been rendered ſo briſtly with Angles, Faces, Points, and needleſs Hooks, that it is not to be conceived how it took Poſſeſſion of all the



I

La Mareſchalerie

Lan. M. CCCCC. XXXIII.

Le Cheual doibt auoir petite teſte ⁊ ſeiche de laquelle ſoit la peau tenant ⁊ abherant aux os. Ait les aureilles courtes ⁊ agues. grãds yeulx ⁊ non cauez les naſeaulx ouuerts ainſi que ſilz eſtoient enflez les machoueres greſles ⁊ ſeiches grãd bouche et eſſiree col long ⁊ greſle pres la teſte le doz court ⁊ quaſi cõme plain les rains ronds ⁊ quaſi gros les couſtes ⁊ les flans comme dung beuf les hanches longues ⁊ eſtendues les cuiſſes larges ⁊ charnues tant par dedens que par dehors les iaretz amples ſecs ⁊ eſtẽduz les faulx amples courbees ⁊ dreſſees cõme dung cerf les iambes amples ⁊ ſeiches ⁊ plaines de poil. Les ioinctures des iambes groſſes ⁊ non charnues. prochaines des ongles a la ſemblãce dũg beuf les ongles ronds fermes ⁊ bien fichez ⁊ ait uniuerſellement les membres au corps proporcionnez tant en longueur quen largeur ⁊ ait auſſi le col leue ⁊ ſoit en groſſeur vers leſtomac. Soit le Cheual plus hault par derriere que par deuant ainſi que le cerf.

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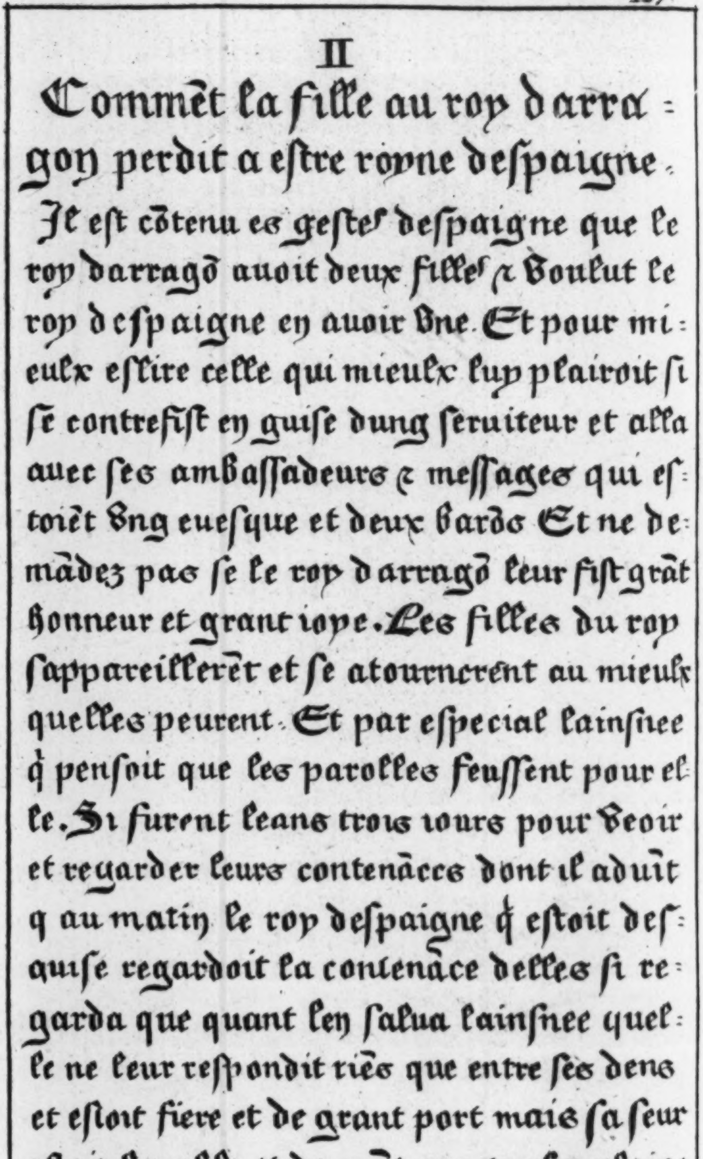


II

Commēt la fille au roy darragon perdit a eſtre royne deſpaigne.

Il eſt cōtenu es geſtes deſpaigne que le roy darragō auoit deux filles ⁊ voulut le roy deſpaigne en auoir vne. Et pour mieulx eſlire celle qui mieulx luy plairoit ſi ſe contrefiſt en guiſe dung ſeruiteur et alla auec ſes ambaſſadeurs ⁊ meſſages qui eſtoiēt vng eueſque et deux bardos Et ne demādez pas ſe le roy darragō leur fiſt grāt honneur et grant ioye. Les filles du roy ſappareillerēt et ſe atournerent au mieulx quelles peurent. Et par eſpecial lainſnee q̄ penſoit que les parolles feuſſent pour elle. Si furent leans trois iours pour veoir et regarder leurs contenāces dont il aduint q au matin le roy deſpaigne q̄ eſtoit deſguiſe regardoit la contenāce delles ſi regarda que quant len ſalua lainſnee quelle ne leur reſpondit riēs que entre ſes dens et eſtoit fiere et de grant port mais ſa ſeur eſtoit humble et de grāt courtoyſie plaine et ſaluoit humblement le grāt et le petit.

Inſcriptions, and of moſt Printing-houſes, from the Middle of the fifteenth Century quite to the Middle of the following. The *Italians* never would make any Uſe of them, and almoſt all the Nations of *Europe*, either from their Example, or from a right Diſcernment, have reaſſumed the *Roman* Character, the Ground of which is found again in every Age, though with greater or leſs Varieties.

II. This *Gothic* Letter, printed in the Beginning of the ſixteenth Century (*a*), is the current Writing of the preceding Age. As your Eyes are not accuſtomed to that Character, you may read the hiſtorical Sample hereto annexed in our own Way of Writing, by means of which the Reading of the other will become a mere Paſtime.

§ *Comment la fille au roi d'Arragon perdit a* (miſſed) *être royne d'Eſpaigne.*

Il eſt contenu ès geſtes d'Eſpaigne que le Roi d'Arragon avoit deux filles, & voulut le roi d'Eſpaine en avoit une, & pour mieux eſlire celle qui mieux lui plairoit, ſi ſe contreſiſt en guiſe d'ung ſerviteur & alla avec ſes ambaſſadeurs & Meſſagés qui étoient ung éveſque & deuz barons: & ne demandex pas ſe le Roy d'Arragon leur fiſt grant honneur & grant joye. Lez filles du Roy s'appareillerent & ſe atournérent au mieulx qu'elles peureut: & par eſpécial l'ainſnée qui penſoit que les paroles fuſſent pour elle. Si furent leans trois jours pour veoir & regarder leurs contenances, dont il advint que au matin le Roi d'Eſpaigne qui eſtoit deſguiſe regardoit la contenance d'elles, ſi regarda que quant len ſalua l'ainſnée, elle ne leur reſpondit rieus que entre ſes dents, & eſtoit fiere & de grant port: mais ſa ſeur eſtoit humble & de grant courtoyſie plaine, & ſaluoit humblement le grant & le petit. Après il regarda que une fois les deux ſeurs jouoient aux tables (Trick track) *avec deux chevaliers: mais l'ainſnee tenſa à l'un des chevaliers & lui mena forte fin,* (finiſhed the Game by making him Reproaches.) *Mais ſa ſeur moins née* (youngeſt) *qui avoit auſſi perdu, ne faiſoit ſemblant de ſa perte, ains faiſoit auſſi bonne chiere* (Countenance, Reception,) *comme*

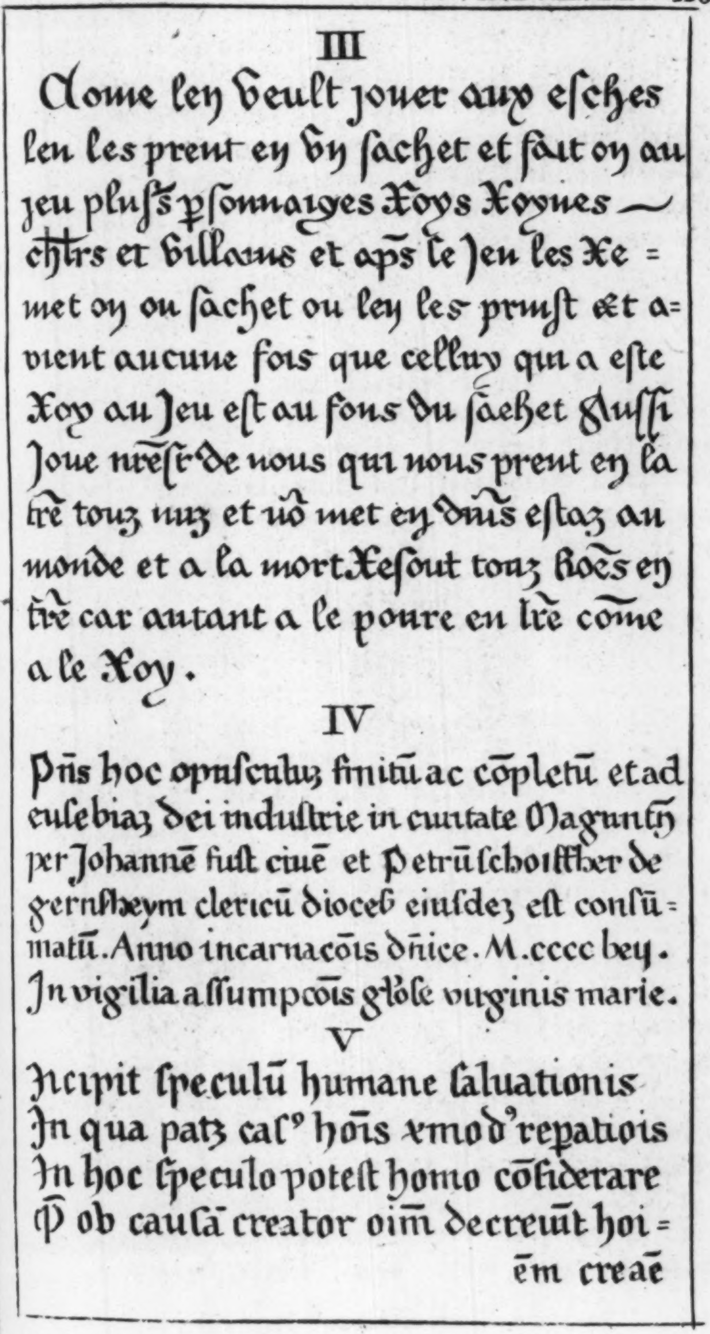
(a) See the Book of the Chevalier de la Tour, Paris, 1514.

ſi elle eût tout gaigné. Le roy d'Eſpaigne qui regarda tout, ſe retira à coſté & appella ſes gens, & leur diſt. Vouz ſcavez que les Roys de Eſpaigne ne les Roys de France ne ſe doivent pas marier par convoitiſe, fors noblement à femme de bonnes meurs, bien née & taillée de venir à bien & a honneur, & pour ce j'ay veu ces deux filles & regardé leurs maniéres & leurs guiſes: Li me ſemble que la plus jeune eſt la plus humble & la plus courtoiſe, & ne'eſt pas de ſi haultain courage, ne de ſi haulte maniére comme l'ainſnée, ſi comme j'ay pu aparcevoir, & pour ce prennez la plus jeune: car je la eſtis. Si luy reſpondirent: Sire, l'ainſnée eſt la plus belle & ſera plus grant honneur à vous de avoir l'ainſnée que la plus jeune: & il reſpondit que il n'eſtoi nul honeur ne nul bien terrien qui reſſemblaſt à bonté & a bonnes meurs, & pour eſpecial à humbleſſe, and pour ce que je lay veue la plus humble & la plus courtoiſe je la vueil avoir: & ainſi l'eſleut.

III. This Writing is of the Beginning of the fifteenth Century, or of the End of the fourteenth. It was taken out of a Manuſcript on a Paper of the Abbey of *St. Victor* at *Paris*, which contains, 1. A Collection of Moralities; 2. A Tranſlation of *Tully*'s Book *de Senectute*, the laſt Sheet whereof bears Date 1405,

Comme l'en veult jouer aux échès, l'en les prent en un ſachèt, & fait on au jeu pluſieurs perſonnaiges, Roys, Royns, Chevalieres, & Villains (*villani*, the Country-People) *& après le jeu les remet on ou ſachet* (in the Bag) *ou len les prinſt: & avient aucune fois que celui qui a eſté Roy au jeu eſt au fons du ſachet. Auſſi joue Notre Seigneur de nous, qui nous prent en la terre touz nuz & nous mèt en divers eſtaz au mon monde, & à la mort reſout tous hommes en terre: car autant a le poure* (the poor) *et terre comme à le Roy.*

IV. and V. Nothing is more ſtrictly connected with the Hiſtory of the Progreſs or Changes of Writing, than the admirable invention of the Art of Printing, which took Place about the Middle of the fifteenth Century, and quite changed the Face of Society, by the many Branches of Learning it ſpread among Men.



III

Come ley veult jouer aux eſches
len les prent en vn ſachet et fait on au
jeu pluſs ꝑſonnaiges Roys Roynes —
chl̄rs et villains et ap̄s le Jeu les Re =
met on ou ſachet ou ley les prinſt et a=
vient aucune fois que celluy qui a eſte
Roy au Jeu eſt au fons du ſachet Auſſi
Joue nr̃eſr̄ de nous qui nous prent en la
trē touz nuz et nō met en dūs eſtaz au
monde et a la mort Reſout touz hōes en
trē car autant a le poure en lrē cōme
a le Roy .

IV

P̄n̄s hoc opuſculuꝫ finitū ac cōpletū et ad
euſebiaꝫ dei induſtrie in ciuitate Maguntī
per Johannē fuſt ciuē et Petrū ſchoiffher de
gernſheym clericū dioceſ eiuſdeꝫ eſt conſū=
matū . Anno incarnacōis dn̄ice . M.cccc lxv .
In vigilia aſſumpcōis glo͛ſe virginis marie .

V

Incipit ſpeculū humane ſaluationis
In qua patꝫ caſ⁹ hōis ⁊ modꝰ repatiois
In hoc ſpeculo poteſt homo cōſiderare
q̄ ob cauſā creator oīm decreuit hoi=
ēm creaē

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In a very fine Manuſcript Copy of the Collection of the Canons of *Gracian*, which is very curiouſly kept in the Library of the *Celeſtine* Monks at *Paris*, the Tranſcriber, who acquaints the Reader with both his Name and Country, declares moreover that he was buſy one and twenty Months together about finiſhing this Copy. At that Rate, we muſt either imploy four thouſand Copiers for nearly two Years, or have only one Copier at a Time during almoſt eight thouſand Years, to have the four thouſand Sets of the ſaid Collection that may now-a-days be furniſhed in leſs than four Months, and be diſtributed into the Hands of the Public at once. No body was better acquainted with or ſet the Hiſtory of this glorious Diſcovery in a clearer Light than the celebrated *Trithemius*, who had frequently converſed on that Subject with *Peter Schoiffer* of *Gernſheim*, Partner to the firſt two Inventors, without the Induſtry of whom the new Project might perhaps have ſunk again into its former Obſcurity. We ſhall chiefly depend here upon his Teſtimony and the Original of Printing, as it is related in the ſecond Volume of his Annals of the Abbey of *Hirſauge*, according to which there is no Doubt but *John Guttenberg* (*a*) of *Mentz* had, about the Year 1440, the firſt Idea of this new Art. He ſpent his Eſtate about it without Succeſs, and then took for his Partners *John Fauſte*, a rich Merchant of the ſame City, and *Peter Schoiffer* (*b*) of *Gernſheim*, a Clerk of the Dioceſs of *Mentz*. *Fauſte*'s Money and the Ingenuity of the young *Schoiffer*, who had devoted himſelf to his Service, gave Birth to ſome firſt Works already very tolerable; the moſt famous of which are the Compilation (*c*) of the Grammar, Rhetoric, Poetry, *&c.* of *John Genoa*, and the *Miroir du Salut de l'Homme* (*d*), which is a rhiming Proſe in very indifferent *Latin*, with lineal Figures without Shades at Top of the Pages. Theſe firſt Impreſſions were made upon wooden Plates, in the ſame Manner as had already been done in *China* and *Japan*. They wrote and drew upon a tranſparent

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(a) He was alſo named Genſfleiſch and Zumjungen:

(b) In German, the Shepherd, the Herdſman, Opilio.

(c) Catholicon Johannis Januenſis.

(d) Speculum humanæ Salvationis.

Sheet of Paper, whatever they thought fit. Then they did it over with a fine Paſte on the Side of the Figures, and clapped it thus upon a proportionable Plate. By this Means the Figures and Characters ſtill appeared, but in an inverted Situation, and from the Right to the Left. When the Paper was very dry, they cut off with proper edge Tools all the Wood which ſurrounded the Strokes of the Letter, and the Out-lines of the Figures. This Wood being hollowed to a ſufficient Depth, ſo as that the out-jetting Strokes might be ſomewhat *in relievo* with regard to the Ground, they ſmeared all the Lines, thus raiſed above the Ground, over with a pretty thick kind of Ink, of which they had much ado to fix the Compoſition and exact Degree. A Sheet of Paper ſpread over the Whole, and gently applied to it with either a Cuſhion or a Preſs, took off the Print of the Figures and Letters, the reſt being a white Ground to them. They all appeared in their true Poſition and ſtood the natural Way from the Left to the Right, when the Sheet was taken off and turned up. Doing the ſame without Confuſion on the other Side of the Leaf was no eaſy Matter; and, in order to ſell theſe Prints the dearer by giving them the Appearance of Manuſcripts, they printed on the *Recto* or Forepart of a Sheet, and then on the *Verſo* or Back of another. The Two white Sides were oppoſite, and, by clapping them one upon another with Paſte, you had a Sheet wrote on both Sides as uſual. The Copy of the *Miroir du Salut*, which is in the Library of the *Celeſtine* Monks at *Paris*, has this Particular in it, that the Sheets have not been paſted together, and the two printed Sides are always backed with two white ones, with an Intention to clap them one againſt the other with Paſte; which betrays the Artifice of the firſt Work.

Our Workmen were ſoon tired with this Method. An ill-paſted Sheet made them loſe a whole Copy when the Plate was worn out. Beſides, theſe carved Plates could ſerve but for one ſingle Work. Thoſe Inconveniences, together with the Smallneſs of the Profits, raiſed in the Minds of one of them, (perhaps of *John Fauſte*, as the Words of *Trithemius* ſeem to imply (*a*), the Thought of

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(a) Gener inventoris primi Johannis Fuſt.

working with ſeparate Characters, that might be aſſembled, then diſunited, and ſorted for the Printing of ſeveral Sheets of the ſame Work, and then uſed again for other Books. But the wooden Pegs terminated at Top by a Character *in Relievo*, being ſucceſſively blackened, waſhed, dried, then moiſtened, ſwelled and dried over and over, were ſoon worn out at the Corners and conſiderably alter'd. New Difficulties aroſe as they proceeded. They had recourſe to ſeveral Metals. They tried to caſt in Moulds ſmall Columns of Lead or Copper terminated each by a Letter. But Lead and Pewter proved both too ſoft. Iron and Copper were too brittle, and ſo the Whole remained rough, uncouth, and of bad Service. The ingenious *Schoiffer* filled his Partners with Joy, by ſhewing them Punchions of the exacteſt Proportion, which he had contrived to form the Hollows, and by ſucceeding in the Mixture of ſuch Metals as were fit to make Characters *in Relievo*, ſo as to correct the Acrimony of a Metal by the Softneſs of another, without hindering the Compoſition from being of the requiſite Hardneſs. Now we are arrived at the Perfection of the Art. *Fauſte* was ſo affected by it, that he gave both his Daughter and Fortune to *Schoiffer*, who, after the Death of *Guttemberg* and *Fauſte*, went on with and kept up Printing at *Mentz*. The firſt and moſt valuable Fruits of this laſt Diſcovery were the fine Bible, compleated in the Year 1462, of which *Fauſte* brought a Number of Copies to *Paris*, where they are ſtill preſerved.

The Article IV. *Præſens hoc Opuſculum*, &c. is the Note put at the End of this Bible by *Fauſte* and *Schoiffer* (*a*)

The Article V. is the Beginning of the *Miroir du Salut*, which is now in the Convent of the *Celeſtine* Monks at *Paris*. They ſhew at *Harlem* a Copy of the ſame *Speculum*, printed likewiſe on Wood.

There is ſome Reaſon for wondering at not finding any Names of Printers in the Pieces printed on Wood, and at not ſeeing the Name of *Guttemberg* at the End of the fine Bible printed with caſt Letters. The Reaſon

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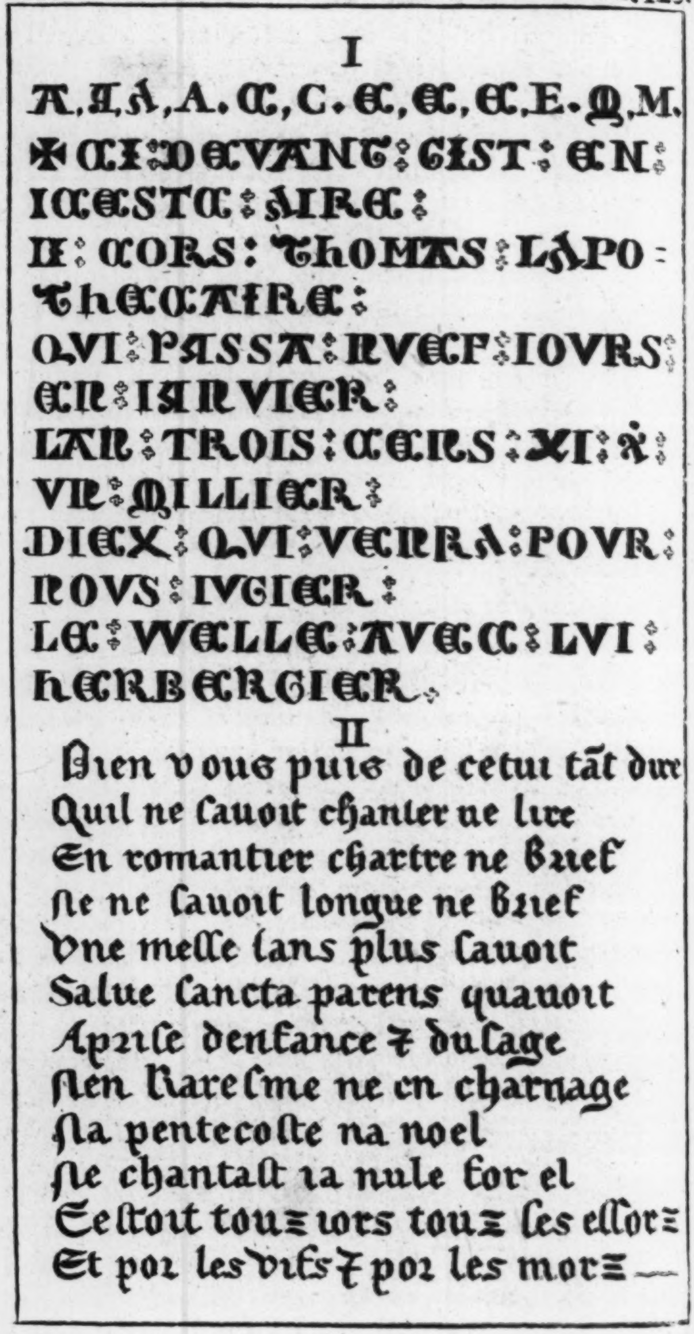
(*a*) After *ad Euſebiam Dei* the Word *induſtriè* is adverbial, and refers to *eſt conſummatum*.

of the firſt Omiſſion is, that theſe Men had a Mind to let their Prints ſtill have the Look of and be thought Manuſcripts, and concealed both their Name and new Art, in order to repay their Charges by ſtill ſelling their Copies upon the Footing of ſo many Manuſcript Copies. The Reaſon of the other Omiſſion is, that *Guttemberg*, having been condemned to pay to the Partnerſhip Advances which he thought himſelf not obliged to make, took a Diſlike to it, and left his Partners, even before the Year 1455. He went and reſided ſucceſſively at *Straſbourg* and *Harlem*, whence he came back to *Mentz*, where he died about the Year 1468. The Eſtabliſhment of his Printing-Houſe at *Straſbourg*, where he worked in Company with *John Mentel*, and at *Harlem*, where he very likely worked in Company with *Laurence Coſter*, gave Birth to the poſterior Notion that the Cradle of Printing was to be looked for in either of theſe Towns; and it has alſo given Birth to the fine Stories made of *Coſter*, whom *Fauſte* had deprived of both his Plates and the Honour of the Invention; and of *Mentel*, whom *Gensfleiſch* uſed in the ſame Manner, in order to communicate the Whole to *Guttemberg*, although *Gensfleiſch* and *Guttemberg* be but one and the ſame Man. In the fine Bible of 1462, in the Pſalter of 1457, in *Tully*'s-*Offices* of 1465, and in a great many other Works, *Fauſte* and *Schoeffer* are always found in Company till 1466, when *Schoeffer* appears alone, after the Death of his Father-in-Law. They not only printed their names at the Head of the Works, but aſſumed the Honour of the new Invention to themſelves; and really the Thing could no longer be kept ſecret after their Parting from *Guttemberg*. But, it being ſtill unknown at *Paris*, in the Year 1462, *Fauſte* bethought himſelf of ſuppreſſing the laſt Sheet of his Bible, and of printing another where the note we have mentioned, Art. IV, was incloſed, and where he forbears ſpeaking of the new Method of multiplying Books, as he did in other Works. The Beauty of theſe pretended Manuſcripts procured him to ſell them as dear as he pleaſed at *Paris*; but finding that the amazing Reſemblance of all his Copies was at laſt much talked of, and the Secret of the new Invention blazed out, he quickly bated the Price of his



I

A, A, A, A. C, C. E, E, E, E. M, M.

✠ CI : DEVANT : GIST : EN :
ICESTE : AIRE :
LI : CORS : THOMAS : LAPO=
THECAIRE :
QVI : PASSA : NVEF : IOVRS :
EN : IANVIER :
LAN : TROIS : CENS : XI : ⁊ :
VN : MILLIER :
DIEX : QVI : VENRA : POVR :
NOVS : IVGIER :
LE : WELLE : AVEC : LVI :
HERBERGIER.

II

Bien vous puis de cetui tāt dire
Quil ne ſauoit chanter ne lire
En romantier chartre ne brief
Ne ne ſauoit longue ne brief
Vne meſſe ſans plus ſauoit
Salue ſancta parens quauoit
Apriſe denfance ⁊ duſage
Nen kareſme ne en charnage
Na penteccoſte na noel
Ne chantaſt ia nule for el
Ceſtoit touz iors touz ſes eſſorz
Et por les vifs ⁊ por les morz

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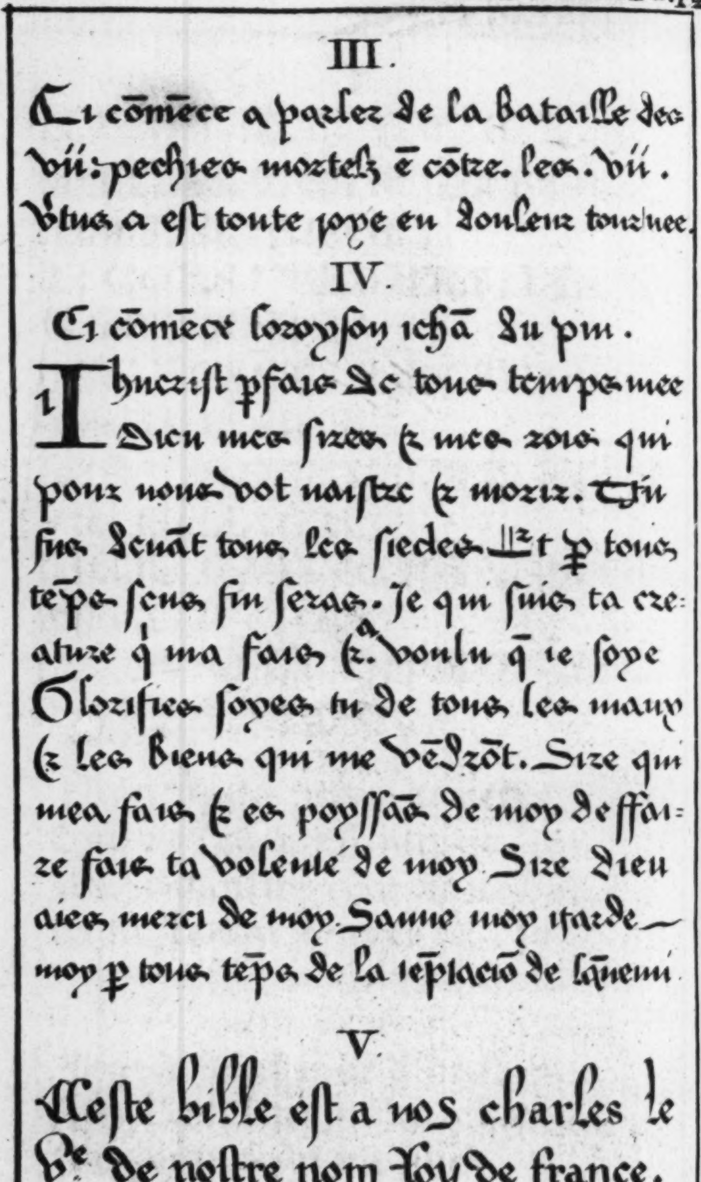

III.

Ci cōmēce a parler de la bataille des
vii: pechies mortelz ē cōtre les . vii .
vtus a est toute joye en douleur tournee.

IV.

Ci cōmēce loroyson ichā du pin.

Ihucrist pfais de tous temps mes
Dieu mes sires & mes rois qui
pour nous vot naistre & morir. Qui
fus devāt tous les siecles. Et p tous
tēps sens fin seras. Je qui suis ta cre:
ature q̄ ma fais & a voulu q̄ ie soye
Glorifies soyes tu de tous les maux
& les biens qui me vēdrōt. Sire qui
mes fais & es poyssāt de moy de ffai:
re fais ta volenté de moy. Sire dieu
aies merci de moy. Sauue moy & garde
moy p tous tēps de la tēptaciō de lēnemi.

V.

Ceste bible est a nos charles le
vᵉ. de nostre nom roy de france.

Charles

his Books, and haſten'd to *Mentz* again, to avoid all Proſecutions and Law-ſuits for over-rating them.

The WRITING *and* LANGUAGE *of the* XV *and* XIV CENTURIES.

I. THIS Inſcription, the Character of which is often met with in the Monuments of the Thirteenth and Fourteenth Centuries, was borrowed from the Cloiſter of the *Grey* Friars at *Rheims*, and was communicated by Mr. *Batteux*, a former Profeſſor of Rhetoric in the Univerſity of the ſame City, and now Profeſſor of Rhetoric in the Univerſity of *Paris:*

Ci devant giſt en iceſte aire (a)
Li Cors (b) *Thomas l'apothêcaire;*
Qui paſſa nuef (c) *Jours en Janvier*
L'an trois cers onze, & un millier.
Diex (d) *qui venera pour nous Jugier*
Le veulle (e) *avec lui hébergier* (f).

(*a*) *Aire*, Place.
(*b*) *Li Cors Thomas*, the Body of *Thomas*; juſt as they ſaid, *La Cour le Roi*, for the King's Court, the Palace where Juſtice is adminiſter'd.
(*c*) *Nuef* for *neuf*, new.
(*d*) *Diex*, God.
(*e*) *Veule* for *Veuille*.
(*f*) *Hébergier* to lodge, to place, to harbour.

II. This Writing was communicated by Mr. *Racine*; and borrowed from a Manuſcript of *Notre Dame* of *Soiſſons*, wherein they have collected ſeveral Miracles attributed to the Virgin *Mary*, to inſinuate this Maxim,

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(*a*) In *Romance*, that is, in *French*. Our vulgar *French* was called *Romance*.

(*b*) *Charter*. Public Acts, Writings ſigned and depoſited in a Notary's Office, or in a Place where Charters are kept.

(*c*) *Brief*. *Bref*. This was the Name given to all Catalogues, compendious Accounts, Letters Patents, and other Pieces of current Writing. *Ibid.* Ne ne ſavoit longue ne brief; that is, Nor did he know what a long or ſhort Syllable was.

(*d*) For *el*. Except that one.

(*e*) *Tous jor: tous ſes efforts.* This he daily did, nor had he any other Learning.

that being exact in directing ſome Prayers to her is a ſure Means of Salvation. Such is the Miracle here ſaid to have been worked in Favour of an ignorant Prieſt, who knew nothing but the Maſs *Salve Sancta Parens*, and never ſaid any other on *Chriſtmas* or *Eaſter-Day*.

‘ III. Ci commence à parler de la bataille des ſept pêchiés mortels en contre les ſept vertus. Ci eſt toute joye en douleur tournée.’

This was borrowed from a ſpiritual Romance, intitled, *Mande-vie*, that is, the Reforming of Manners. It is partly in Verſe and partly in Proſe, written on Paper, and was communicated by the Abbé *Vatry*, of the Academy of the *Belles Lettres*, and Inſpector of the Royal College. The following Writing is of the ſame Manuſcript:

‘ IV. Ci commence l'Oroiſon Jehan Du Pin.

‘ Jeſus-Chriſt, perfaits de tous tems, mes Dieu, mes Sires, & mes Rois (a). Qui pour nous vot (b) naitre & morir. Et tu fus devant tous les ſiécles, & par tous tems ſans fin ſeras. Je qui ſuis ta créature: qui ma fais & a voulu que je ſoye. Glorifiés ſoyes tu de tous les maux & les biens qui me vendront. Sire qui me a fais, & es poyſſans, (c) de moi desfaire (d) fais ta volenté de moi. Sire Dieu aies merci de moi. Sauve moi. Garde moi par tous temps de la temptacion de l'anemi.’

V. The two laſt Lines are copied from thoſe written at the End of the Bible of *Charles the Wiſe*, and ſigned with his own Hand. It is the ſame Bible in which this no leſs pious than learned Prince uſed to read every Day, on his Knees, and with his Head bare. It is preſerved in the Library of the *Celeſtine* Monks at *Paris*; and this fine Stroke is atteſted, on the Cover of the Book, by the illuſtrious *Muiſiere*, one of his chief Officers, who was moſt intimately familiar with him. The Reverſe of this has happened to many a Hero: Nor have they had any greater Enemies of their Glory than their own Valet-de chambres.

(a) *Mes Dieu, mes Sires, & mes Rois.* My God, my Lord, and my King. They ſtill ſpeak after this Manner in ſome of our Provinces: And we ſtill uſe the Word *Meſſire.*

(b) *Vot,* Would.

(c) *Poyſſans,* Powerful.

(d) *De moi desfaire.* Thou canſt deſtroy me.

The WRITING *and* LANGUAGE *of the* XIII. *and* XII. CENTURIES.

I. THE Proverbs we have choſen for Samples of both the Writing and Language of the Thirteenth Century are borrowed from a Manuſcript of the *Feuillans* * of the Place of *Lewis the Great* †. It is written on Parchment.

(*a*) ‘ A chaſcun Oiſel ſes nis li eſt biaux.
(*b*) ‘ A Cor le Roi chaſcuns i eſt pour ſoi.
(*c*) ‘ Alons, alons, ce dit la grue:
‘ De tout lou jor ne ſe remue.
(*d*) ‘ Amors en cuer: ’feus en eſtopes.
(*e*) ‘ A cui meſchiet, l’en li méſofre.

II. This Morality, and the Recital in the common Letter of the Text, which is immediately after this Paragraph, are borrowed from a Manuſcript, in Parchment, of the Library of St. *Victor* of *Paris*, Side 1167, which ſeems to be of the Time of *Philip the Fair*, becauſe *Lewis* the IXth is ſtiled a Saint there, which Name was given him in *Philip the Fair*’s Time, and there are beſides Lamentations concerning the Miſeries of Slavery, which the Country-people redeemed themſelves from during the Reign of the three Children of that Prince. This Manuſcript contains ſeveral Pieces, the moſt extenſive of which is the Treatiſe on the Miſery of Man. The following Lines are a ſhort Extract of it:

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* An order of religious Monks.

† Called *Place de Vendôme* at *Paris*.

(*a*) Each Bird likes his own Neſt.

(*b*) Every one ſtands for himſelf at the King’s Court.

(*c*) *De tout lou jor*. All Day long.

(*d*) Love in a Heart is Fire in Tow.

(*e*) No Preſent, nor any Offer is made him to whom Miſchief happens.

'O vanité des Vanites! Com plus porte len (*a*) donneur au belles veſteures que aus vertus, & plus à beauté que à honneſteté?

'Il avint jadis que uns philoſophes veſtus & atournes de laid habit & de vil, volt (*b*) entrer en un palais à un hault Prince. Et appella à luis (*c*) et bouta (*d*) longuement & pluſieurs fois, ne oncques tant ni ſout (*e*) appeller que len li laiſſat entrer. Mais toutes celles foit qu'il ſe pena de l'entrer, tantes fois en fu en ſus boutés (*f*). A donques mua (*g*) ſon habit & priſt plus riche. Et tentoſt à la premiere voix ot congié de ens (*h*) entrer. Et quant il fut dedens ſi priſt moult (*i*) ſouvent à baiſier le riche mantel qu'il avoit au col, moult honoreement. Et li princes moult de grant maniere merveillans de ce qu'il faiſoit li demanda pourquoy il faiſoit ce. Et li philoſophe li diſt. Je honore ce qui m'a honoré. Car ce que ma vertu ne pout (*k*) faire, à doncques ce fait ma belle robe.'

III. This Piece of Writing, the firſt Letters of which are of the ſame Size here as thoſe of the Original, is borowed from a very fine Manuſcript on Parchment of the Library of *St. Victor* of *Paris*, which contains *the ſeven Hours of the Paſſion*, in *French* Verſe, together with Pſalms and other Prayers, in *Latin*. The Manuſcript ſeems to have been made for ſome Lord in the Time of the firſt *Cruſades*. The *French* of it is more obſolete than that of the Time of St. *Lewis*, and ſeems much to be of the XIIth Century. The Office of the Paſſion was the great Devotion of the Holy Sepulchre: and, in the Suffrages at the End of the ſaid Office, you always find theſe Words, *noſtram Cadiam*, as much as

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(*a*) *Comme plus porte len donneur.* How is it that one reſpects more, &c.

(*b*) *Volt*, Would.

(*c*) *A luis.* At the Door.

(*d*) *Bouta*, puſhed, or knocked.

(*e*) *Tant ni ſout* Nor could he knock ſo, &c.

(*f*) *En ſes boutés.* Puſhed back, turned out.

(*g*) *Mua*, changed. *Ot congié*, had Leave.

(*h*) *Ens*, in, *intus*.

(*i*) *Much* from *multum*.

(*k*) *Ne pout*, could not. 'Tis the *Latin* Word *potuit* not well pronounced.

to ſay our Society, our Dioceſs: Which cannot be underſtood but of the *Levant*, where a Diſtrict is called *Cadiz* and the chief Judge of any Juriſdiction called *Cadi*.

‘ Jou (*a*) ai a (*b*) nom H . . . qui le ditier (*c*) a ‘ fait
‘ Dites (*d*) Dieus me pardoinſt de quanque (*e*) jou ai ‘ meſſait.
‘ Et puis ſi (*f*) vous dirai de ſiet enures Ki ſunt.
‘ Plus precieuſes (*g*) d’autres & plus à garder ſont.
‘ A l’heure de matines fu li confiaux (*h*) tenus,
‘ Comment li bias Jeſus ſeroit pris et bâttus.
‘ Aſſanblé ſunt li Juis, li grant et menu.

Here are a few Strokes of the following Hours, whereby you may judge of the Language as well as of the Writing.

‘ Droit (*i*) à l’heure de Prime fu Diex tous deſpolliés, ‘ *&c.*
‘ Dont fu vilteuſement (*k*) meſnés & traitiés, *&c.*
‘ Quant il véoit venir les cos (*l*), ſi s’enclinoit.
‘ Des biaux ioex (*m*) de ſon chief fondicement ploroit.
‘ En non pour tant, ſachiez, un ſel mot ne diſoit.
‘ De tout ce grief torment con ſoufrir li ſiſoit.

(*a*) *Jou.* I,

(*b*) *A nom*; for my Name. The Name is in Blank.

(*d*) *Dittes*, &c. Pray God that he will pardon me all the Evil I have done.

(*e*) *Quanque.* An Abbreviation of *quodcunque.*

(*f*) *Et puis ſi vous dirai*, &c. And then I’ll tell you, or entertain you concerning the ſeven Hours which are more, *&c.*

(*g*) *Plus precieuſes d’autres*, that is, *than the others.* This Turn of Phraſe, which is ſtill in the *Italian* Language, is no longer uſed in ours. *Et plus à garder ſont:* that is, *and are kept with greater Beneſit.*

(*i*) *Droit*, juſt. *Adv.*

(*k*) *Vilteuſement*, *viliter*, outrageouſly.

(*l*) *Cos*, *les coups*, the Blows.

(*m*) *Ioex*, *yeux*, Eyes. *Des beaux yeux de ſon chef* (*fondicement*) *abondament pleuroit* Floods of Tears ran from the beautiful Eyes, his Head. Ibid. *Con ſoufrir li ſiſoit*, *qu’on lui faſoit ſouffrir*; which they made him ſuffer.

‘ Car notre ſavement (*n*) ſi forment (*o*) deſiroit
‘ Que ſe char & ſe ſang (*p*) pour il deliveroit.
Or devons nous cette heure cremir (*q*) & redouter
‘ Et de grief travail nos doit bien ramembrer (*r*)
‘ Quant nos oons (*s*) la cloke (*t*) de Prime retentir,
‘ A donc devons nous mettre nos cuers (*u*) à Dieu ſervir.
‘ Ki ſe ſunt li doi Juis briement le vos dirai,
‘ Cis Ki battoient Jheſum, ne vous en mentirai
‘ . . . . . (*x*)
‘ Li uns ce ſont ces gens plain de loſengerie (*y*)
‘ Auſſi com fut Judas plains de grand trecherie (*z*)
‘ Bial (*aa*) ſanblant font à autres, ſi lor font bielle
‘ chiere (*bb*)
‘ Et dont ſe deparolent (*cc*) quant il ſunt par derriere, *&c.*
‘ A l'hore droit de Tierce fut Dieux jugiés à mort
‘ Dégabés (*dd*) & battus, & traitiés à grand tort.
‘ Lui méiſmes Jheſum fiſſent (*ee*) porter ſa Croix
‘ Li felon (*ff*) li mavais, li cuierts maleoit (*gg*)
‘ Ce fu uns grans Mairiens (*hh*) qui étoit ſi peſans
‘ Que il avoit le fais de deux hommes poiſſans, *&c.*

(*n*) *Savement*, *Salut*, Salvation.

(*o*) *Forment*, *Fortement*, ſtrongly.

(*p*) *Se char & ſe ſang. Sa chair & ſon ſang*; his Fleſh and Blood.

(*q*) *Cremir*, *Criandre*, Fear.

(*r*) *Ramembrer*, for *rememorer*, *rappeller le ſouvenir*, to remind.

(*s*) *Oons*, *entendons* from *Ouir*, which derives from a bad Pronunciation of *audire*. We hear.

(*t*) *La coke*. The Bell.

(*u*) *Cuers*, *Cœurs*, Hearts.

(*x*) *Je vous dirai brievement & ne vous déguiſerai pas qui ſont ou à quelles gens reſſemblent les dis Juifs, ceux qui battoient Jeſus.* I will tell you in a few words, and without diſſembling any Thing, what Sort of People were thoſe *Jews* who ſtruck *Jeſus*. *Doi* is as much as to ſay, *dicti*. In the ſame manner as *Benoit* anſwers to *benedicti*, and *maleoit* to *maledicti*.

(*y*) *Loſengerie*, *perfidie*, Flattery, perfidiouſneſs, from *Laus*.

(*z*) *Trecherie*, *Tromperie*, Deceit.

(*aa*) *Bial*, *Beau*, Fine.

(*bb*) *Bielle chiere*; *belle chere*, good Reception.

(*cc*) *Se deparolent*, Recant, do the Reverſe.

(*dd*) *Dégabés*, ridiculed, injured.

(*ee*) *Fiſſent*, *firent*, Made.

(*ff*) *Felon*, *Traitre*, Traytor.

(*gg*) *Li cuierts maleoit*; *Les cœurs maudits*; the curſed Hearts.

(*hh*) *Ce fu une grans mairiens*; *cette Croix etoit une grande Piece de Bois*; from *Materia*, Wood. This Croſs was a huge Piece of Wood.

‘ A

‘ A l’hore de midi fut li grand cris criés
‘ Comment li biaus Jheſus ſeroit à mort livrés. . . .
‘ Grandes brokes de fier (*ii*) un fevre fiſſent faire . . . .
‘ Li doi maiſtres des Juis les brokes aporterent
‘ A (vec) s Martias de fier (il) Jheſum enclaverent (*kk*)
‘ Parmi les mains li fierent (*ll*) par ſi grande viertu (*mm*)
‘ Que ſe ſan (*nn*) par la tierre à grand rius (*oo*) en courut.
‘ Sour le mont de Cavaire un courtis il aſtoit (*pp*)
‘ Une haie d’eſpines tout en tour i avoit.
‘ Li uns des felons Juis viers la haie en ala
‘ A ſes mains priſt l’eſpine & briſa & (li) ga
‘ Si en fit un capiel, &c. (*qq*)
‘ Puis li briſent les mains, les jambes li treillerent (*rr*)
‘ L’un par deſeure (*ss*) l’autre. Si tres roit (*tt*) li claerent
‘ Que tout le contordirent auſſi cum une hart . . . .
‘ En tel point que li vins (*uu*) eſt del ſtordoïr preſſés
‘ Tout auſſi fut Jheſus dedans le crois pénés, *&c.*
‘ Quant il aproiſma nuene (*xx*) que Jheſus veut morir
‘ De ſon precieux cors s’arme (*yy*) veut departir
‘ Il a dit à ſon Pere en getant un ſoupir

(*ii*) *Grandes brokes de fier un fevre fiſſent faire.* They cauſed long iron Spits or Nails to be made by a Smith. *Ils firent faire de grandes broches de fer, de longs clous, par un ouvrier. Fevre*, from *Faber.*

(*kk*) *Avecs martias de fier il Jheſum enclaverent. Ils enclouérent Jeſus avec des marteaux de fer* They nailed Jeſus with iron Hammers.

(*ll*) *Li fierent*; Ran his Hands through. *Lui enfoncèrent.*

(*mm*) *Viertu*, Force, Strength.

(*nn*) *Se ſan*; *ſon ſang*, his Blood.

(*oo*) *A grand rius*; *a grand ruiſſeau*; Great Floods. *Rius*, from *rivus.*

(*pp*) *Un Courtis il aſtoit*; *Il y avoit un jardin. Aſtoit*, from *aſtabat*; There was a Garden.

(*qq*) *Capiel*; *Chapeau*, *couronne*, a Hat, a Crown.

(*rr*) *Treillerent*, *Croiſérent comme on croiſe les bois d’une treille*; Laid them acroſs like the Poles of a Vine-Arbor.

(*ss*) *Par deſeure*; *Par deſſus*; *Over.* Theſe words are ſtill uſed in ſome Provinces.

(*tt*) *Tres roit*; *Tres roide*; Very right. *Si tres roit li claerent*; *Ils les attachèrent ſi roides & tellement tirées*, &c. They tied and ſtretched them out to ſuch a Degree, *&c.*

(*uu*) *Li vins*; *Le vin*, Wine. *Eſt del ſtodoir preſſés*, is ſqueaſed in the Preſs. *Stodior*; from the old *French* Word *eſtordre*, which is the Latin *extorquere.*

(*xx*) *Il aproiſma nuene*; *Le tems de none approcha*, When the Hour of Noon was near at Hand. It is the Latin *approximavit.* Whence our old Word, *Li proiſme*; that is, *one’s Neighbour*, from *proximus.*

(*yy*) *S’arme* for *S’ame*, that is, *ſon ame*, His ſoul, a very common Expreſſion

‘ Doux Peres en tes mains (jou) commant mon enſpir (zz).
‘ Puis releva ſe voix, un grand cris a getet
‘ Apries *A* ſon benoit chief ſour ſon brache inclinet, *&c.*
‘ Li cris fu Eloy lamaſabactani
‘ çou eſt: mes Dieus, mes Dieus qui m'avez relinqui, *&c. &c.*
‘ A l'hore de vieſpres fu Jheſu-Chris deſpendus;
‘ A l'hore de Complie ſu le cors embaumes
‘ De Jheſu noſtre pere el ſepulchre poſés
‘ Ce fu un biaus Sarkeus *B* novias appareillée.

IV. This Piece of Writing, perfectly like its Original, together with the Sequel in common Letter, is borrowed from a Manuſcript on Parchment of the Library of St. *Victor* of *Paris*, which is a collection of very ancient Sermons *Numb.* 874, of the New catalogue. They are all very ſhort except the firſt, which is directed to a Synod, that is to a Congregation of Prieſts. We choſe this preferable to the reſt, and took the Beginning of it, becauſe it contains the Symbol, or Creed, and the Lord's Prayer; both of them reſpected Forms, which, as they change but little from one Age to another, therefore preſerve a greater Air of Antiquity.

Paſce oves meas.

‘ Seignor (s) Prevoire (s) (*a*) cette parole ne fu mie ‘ dite ſolement à mon ſeignor ſaint Pere (*b*). Car à nos ‘ fu ele auſement (*c*) dite. Ce devons nos entendre qui

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Expreſſion. *Li cors & l'arme* that is, *le corps & l'ame*; The Body and the Soul. Theſe are the firſt Words of the twenty-ſecond Pſalm, by which our Saviour, when on the Croſs, applied to himſelf the whole Propheſy, which is applicable to no other.

(zz) *Enſpir*; *Eſprir*; *Spiritus*; *Ame*, Soul.

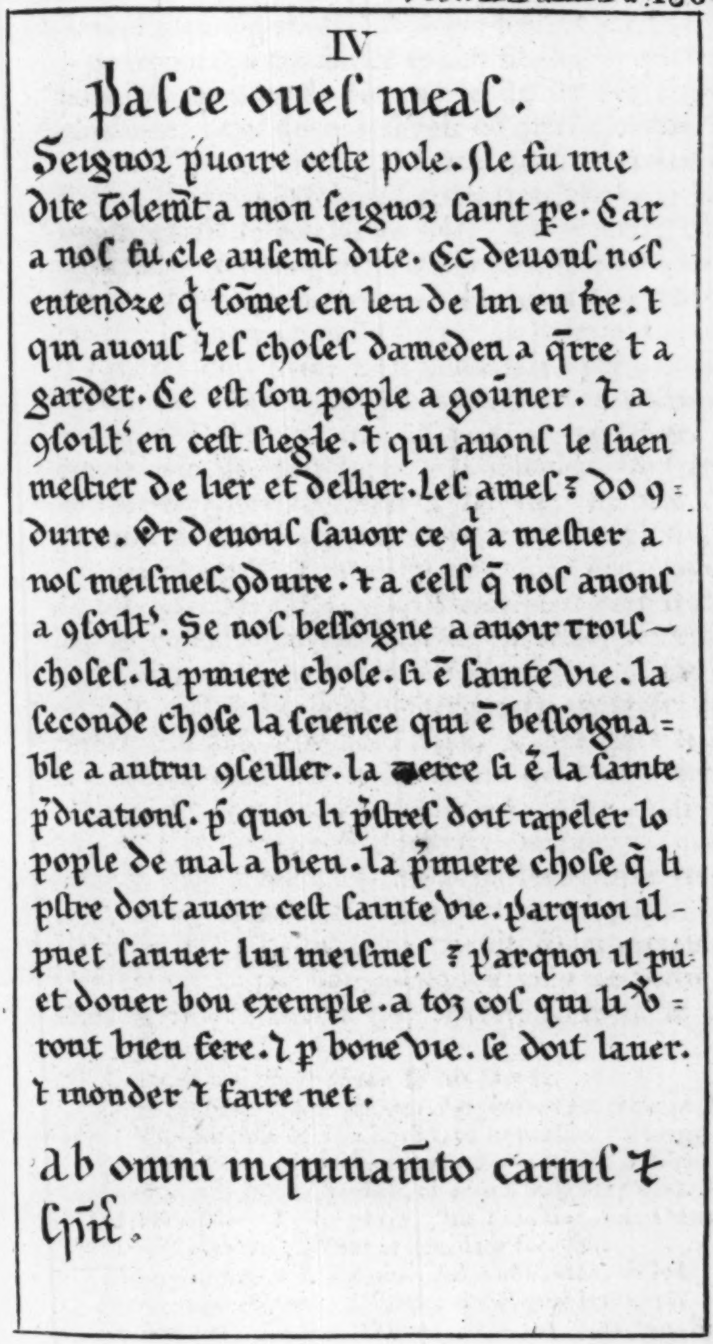
A *Apries*; *Après*, and then.

B *Sarkeus*, *cercueil*, Coffin. *Novias appareillés*, New, newly made. *Nouveau*, *novellement fait*.

(*a*) They uſed *Preſtre* and *prevoire* indifferently. It is the Word *Preſbyter* altered.

(*b*) *Saint Pere*, for *ſaint Pierre*, St. *Peter*.

(*c*) *Amuſement*; *Auſſi*, Alſo.



IV

Paſce oueſ meaſ.

Seignor ꝑuoire ceſte pole. ſle fu une
dite ſolem̄t a mon ſeignor ſaint ꝑe. Car
a noſ fu. ele auſem̄t dite. Ec deuonſ nóſ
entendre qͥ ſom̄eſ en leu de lui eu t̃re. ⁊
qui auonſ leſ choſeſ damedeu a q̄rre ⁊ a
garder. Ce eſt ſon pople a goūner. ⁊ a
ꝯſoilt' en ceſt ſiegle. ⁊ qui auonſ le ſuen
meſtier de lier et deſlier. leſ ameſ ⁊ do ꝯ=
duire. Or deuonſ ſauoir ce qͥ a meſtier a
noſ meiſmeſ ꝯduire. ⁊ a celſ q̄ noſ auonſ
a ꝯſoilt'. Se noſ beſſoigne a auoir troiſ—
choſeſ. la ꝑmiere choſe. ſi ē ſainte vie. la
ſeconde choſe la ſcience qui ē beſſoigna=
ble a autrui ꝯſeiller. la terce ſi ē la ſainte
p̃dicationſ. ꝑ quoi li p̃ſtreſ doit rapeler lo
pople de mal a bien. la p̃miere choſe q̄ li
ꝑſtre doit auoir ceſt ſainte vie. parquoi il -
puet ſauuer lui meiſmeſ ⁊ parquoi il pu=
et doner bon exemple. a toz coſ qui li v=
ront bien fere. ⁊ ꝑ bone vie. ſe doit lauer.
⁊ monder ⁊ faire net.

ab omni inquinam̄to carniſ ⁊
ſp̄ſ.

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‘ ſomes en leu (*d*) de lui en terres & qui avons les choſes Dame Deu à quere (*e*) & à garder. Ce eſt ſon pople à governor & a conſoiller en ceſt ſiegle, & qui avons le ſuen (*f*) meſtier de lier & de deſlier les ames & à conduire. Or devons ſavoir ce qu'il a mettier (*g*) à nos meiſmes conduire, & à cels que nos avons à conſoiller. Se nos beſoigne à avoir trois choſes. La premiére choſe ſi eſt ſainte vie. La ſeconde choſe la ſciencequi eſt beſoignable à autrui conſeillier. La tierce ſi eſt le ſainte predications. Par quoi li Preſtres doit rapeler lo pople de mal à bien. La Premiere choſe que li Preſtres doit avoir c'eſt ſainte vie, par quoi il puet ſauver lui meiſme & par quoi il puet donner bon example à tos ços qui li verront bien fere. Par bonne vie ſe doit laver, & monder, & faire net, *ab omni inquinamento carnis & ſpiritus*, de tote lordure de ſon cors & de s'arme, de luxure, de glotonie, de jvrece, d'orgoil, de avarice, de haine, de covoitiſſe, & de tôtes icecles choſes dont s'ame puet eſtre mal miſſe (*h*) & enleidie devant Deu ou ſa parſonne devant lo ſiegle enpiriée (*i*). Il doit ètre ſouffranz, ſe lan di dit ou fait mal. Et doit doner par ce exemple de pacience & ſi doit eſtre humilianz, & benignes & larges & enſidoit eſtre par la bone vie qui'l doit mener ſi comme dit Notre Sires *lux mundi*, eſtro lumiere en terre. Car il doit enſeignier & enluminer les cuers de ços qui plus aiment les choſes terriennes que celes do Ciel, & en dementres (*k*) qu'il ſont en peichié & en maleſhuevres (*l*), qu'il les chaſtit & les ramaint par predication & par bon conſoil à voie de verité. . . . Mais ſe il ſe demoine (*m*) mauvaiſſement, & il ſoit

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(*d*) *En leu de lui*; *En ſa place*; In his Stead.

(*e*) *Les choſes Dame Deu à querre*; *Les intérets du ſeigneur Dieu à chercher*; The Intereſt of the Lord God to purſue. *Querre*, is the *Latin* Verb *Quærere*. *Dame Deu* is the *Latin* itſelf, *Dominus Deus*, pronounced as it is in *vice Dominus*, of which they have made *Vidame*.

(*f*) *Le ſuen meſtier*; *Le ſien mettier*; his Function, his Office,

(*g*) *Ce qu'il a mettier*; What is neceſſary for, &c.

(*h*) *Mal miſſe, male miſſa defigurée, ſalie*; diſigured, ſoiled.

(*i*) *Enpriée moins eſtimable*: Whence the *Engliſh* impaired.

(*k*) *En dementres*; *Lorſque*, When. It is the *Latin* dum interea.

(*l*) *Maleſhuevres, mala opera, Mauvaiſes actions. habitudes, &c.* Bad Actions bad Habits, &c.

(*m*) *Se il ſel demoine*; *s'il ſe demène*, If he demeans himſelf.

‘ en peichié mortel, ſaiche-il veraiment qu’il manoiera
‘ le cors notre Seignor à dampnation de ſoi (*n*) . . . .
‘ Volons monſtrer que la premiere choſe qui eſt cove-
‘ nable à prevoire ſi eſt ſainte vie. La ſeconde ſi eſt
‘ la diſcreption & la Science pour quoi il doit conſeiller
‘ les armes qu’il à governer.

Ci ſunt li livres (*o*) que li Preſtre doit avoir: *librum ſa-*
‘ *cramentorum, lectionarium, baptiſterium, compotum* (*p*), *pœ-*
‘ *nitentialem, pſalterium, omelias per circulum anni Domi-*
‘ *nicis diebus & Feſtivitatibus aptas,* & maintes autres
‘ choſes; *de vita ſacrorum ordinum* . . . . . Par la
‘ Science, de ces livres qui ci ſunt nomme doit il
‘ avoir diſcreption e ſens à conſeillier lo pople qu’il a
‘ à garder & ſavoir quex peicheors il doit aſſodre (*q*),
‘ & auquex il doit neer (*r*) l’aſſolution & ſaichoir (*s*)
‘ certenement que ſelon reſon & ſainte Eſcriture & ſelon
‘ la doctrine des nos ſans Peres, il ne doit mie aſoldre lo
‘ peicheor de ſon peichié ſe il ne s’en repent parfite-
‘ ment, & ſe il ne le deguerpiſt (*t*) & ne promit qu’il
‘ ſan tandre des illuec en avant (*u*) à ſon pooir (*x*), *Non*
‘ *enim debetis os aperire ad ſolvendum peccatorem,* ſe
‘ vos n’apercevez par certenes demonſtrances & à ſes
‘ paroles & à ſes contenement, que Dex par ſa grace
‘ ſoit deſcendus en ſon cuer & qu’il ſoit reſuſcitez de la
‘ mort de ſon peichié. Car nos liſons en l’Evangile
‘ que notre ſeignor reſuſita mon ſeignor Saint Ladre (*y*)
‘ & apres comanda à ſes Apoſtres: *Ut eum ſolverent, ſolvite*

(*n*) *Saiche-il—de ſoi*; *Qu’il ſache vrament qu’il manoiera le corps de Nôtre Seigneur à ſa condannation*; He muſt know that he ſhall handle the Body of our Lord to his Condemnation.

(*o*) *Ci ſunt li livres*; *Ce ſont ici les livres que le Prêtre doit avoir*; These are the books which the Prieſt ought to have.

(*p*) *Competum,* the paſchal Compotation. *Le Comput,* Paſchal.

(*q*) *Et ſavoir quex peicheors il doit aſſodre,* that is, *et ſavoir quels pécheurs il doit abſoudre*; And know what Sinners he ought to give Abſolution to.

(*r*) *Neer*; *Nier,* Deny, Refuſe.

(*s*) *Saichoir,* the ſame as *Savoir*; of which obſolete Verb we ſtill uſe *ſachons, ſachez, &c.* To know.

(*t*) *Deguerpiſt*; If he does not leave or renounce it; *S’il ne le quitte & n’y renonce.*

(*u*) *Des illuec en avant*; *D’ores en avant, de ce moment et pour toujours:* Henceforward. *Illuec* comes from *illinc* or *illicò*

(*x*) *Pooir*; *Pouvoir,* Power.

(*y*) *Ladre*; *Lazare,* Lazarus.

‘ *inquid eum & finite abire.* Enſi devons nos fere quant nos veont que li peichieres (*zz*) ſe repent angoiſſoſement & il en a ploré & promet fermement qu'il ſan gardera, ne qu'il james ni en charra (*a*). Lors devons nos entendre que Dex velt que nos laſſoillons & doingnons penitence, & ſeil dit Sire je ſui en ceſt peichié, mes je ne puis ne no voil guerpir encores, ſi le devons eſpoanter, & giter de ſon peichié ſe nos poont: & ſe nos ne poons, ſi le devons laiſier aler ainſi com il i vint. Fors (*b*) tant que nos li devons dire que ſil eſt prit en ſon peichié mortel ou criminel il eſt dampnez ſans redemption...'. Then the Preacher proceeds with an explanation of the Matter of mortal ſins, which is almoſt the pure ſacred Text; and after having inſiſted on the Neceſſity of making Men renounce all criminal Habits, he thus comes to the Neceſſity of Preaching, *ſymbolum laicis*.

‘ Nos creons la Saint trinité, lo Pere & lo Fils & lo Saint Eſperits. Nos creons li Peres & li Fiz & li Sainz Eſperiz eſt uns Dex tot poiſſant & perdurable. Nos creons que Dex li Perez anſamble, o le fils (*c*) & o le Saint Eſperit fit lo ciel & la terre & totes choſes de neiant. Nos creons bien que li Fis priſt char en la Vierge Marie, & qu'il ſoffri paſſion & liens Pilate (*d*). & qu'l morut en crois por home traire de la poeſte au Deable (*e*), & qu'il fu mis ou ſepulcre, & au tiers jor reſuſcita de mort à vie, & qu'il monta el ciel, & qu'il ſiet a la deſtre de ſon pere, & qu'il vendra au jor de joiſſe (*f*) jugieur les vif & les Mors & rendra à chaſcun ce qu'il aura deſervi (*g*). Nos creont que li Saint Eſperis eſt aorez & glorifiez avec lo Pere & o le Fils. Nos creons au Sainte Igliſe & en Saint bapteſme. Nos creons la reſurrection do cors au jor do joiſſe, & la bone créance ſi eſt amer ſon proiſme (*h*) veraiment. Ce eſt la

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(*zz*) *Peichieres*; the ſame as *peebeor*.

(*a*) *En charra*; *Tombera*, from the Verb *cheoir*, will fall into it.

(*b*) *Fors tantque*; *Hors*, *ſinon que*, except that.

(*c*) *O le fils*; *Avec le fils*, together with the Son. *O* is very frequently uſed in the twelfth and eleventh Centuries to ſignify *avec*, with. Perhaps it is an Abreviation of it.

(*d*) *Liens Pilate*; *Les liens de Pilate*, Pilate's Bonds,

(*e*) *Por home traire de la poeſte au Diable*; *pour tirer l' homme de la puiſſance* (poteſtate) *du Diable*; To extricate Man out of the Power of the Devil

(*f*) *Au jor de joiſſe*; *Au jour de juſtice*; in the Day of Juſtice.

(*g*) *Deſervi*; *Mérité*, deſerved.

‘ la créance par quoi ſainte Igliſe croit & conoit
‘ Deu. Qui ceſte créancé a, & fair bone heuvre ſi
‘ puet eſtre ſegurs (*i*) qui'l en aura bon guerredon
‘ (*k*), el regne celeſtial, o les beneois amis Deu
‘ (*l*). Car ſi comme li Apoſtres nos dit, ſans foi
‘ ne puet nus hom plaire à Deu & ice devez vos dire
‘ aus Diemenches à voſtre pople, & ice amoneſter & lor
‘ devez dire que il ne perdent lo bien qui eſt en aus. . .
‘ Seignor provoire metez la ſainte foi qui eſt fondement
‘ de tos biens as cuers des homes que vos avez à conſeil-
‘ ler que il puiſſent ſeinement & fermement ſus edifier
‘ les vertus & les bones heuvres. . . .

La Pater Noſtre.

‘ Sire pere, quiés ès ciaus, ſanctifiez ſoit
‘ li tuens nons, avigne li tuens regnes, ſoit
‘ faite ta volanté, ſi comme ele eſt faite el ciel, ſi ſoit
‘ ele fait en terre. Noſtre pain de chaſcun jor nos done
hui, & pardone nos nos meſfais, ſi comme nos pardo-
nons à ços qui meſfai nos ont. Sire ne ſoffre que
‘ nos ſoions tempté par mauveſſe temptation, mes Sire
‘ delivre nos de mal.

‘ En treſtotes les paroles & les proieres qui onques
‘ furent dites, (ou) commandées en terre ſi eſt la plus
‘ ſainte & la plus digne & la plus haute la Pater
‘ noſtre. . . . .

‘ Et parceque nos volons que vos ſaichoir que vos dites
‘ & que vos demandez à Deu quant vos la dites, ſi nos
enſeignerons & dirons en Romans (*m*) que vos dites, &
‘ que la lettre a en ſoi ce quele nos enſeigne. Car
‘ quant nos diſons la Pater noſtre, ſi faiſont ſept requeſtes
‘ à Deu. Ce ſont ſept petitions, or diſons, la premiere
‘ petition que nos faiſons à Deu quant nos diſons *Pater*
‘ *noſter qui es in cœlis*. Tex apele (*n*) Deu pere quant il
‘ dit la Pater noſtre qui n'i a droit, car il n'eſt pas fis
‘ Deu

(*b*) *Proiſme, prochain, proximus,* one's Neighbour.

(*i*) *Eſtre ſegurs.* It is the *Latin ſecurus, ſûr,* ſure.

(*k*) *Guerredon,* Recompenſe, Reward.

(*l*) *O les beneois Avec les benits, les heureux amis de Dieu:* With the bleſſed Friends of God.

(*m*) *En romans*, that is in our vulgar Language.

(*n*) *Tex apele Deu pere, &c. Tel appelle Dieu ſon pere qui n'a pas droit de, &c.* Such calls God his Father, who is no Way intitled to, &c.

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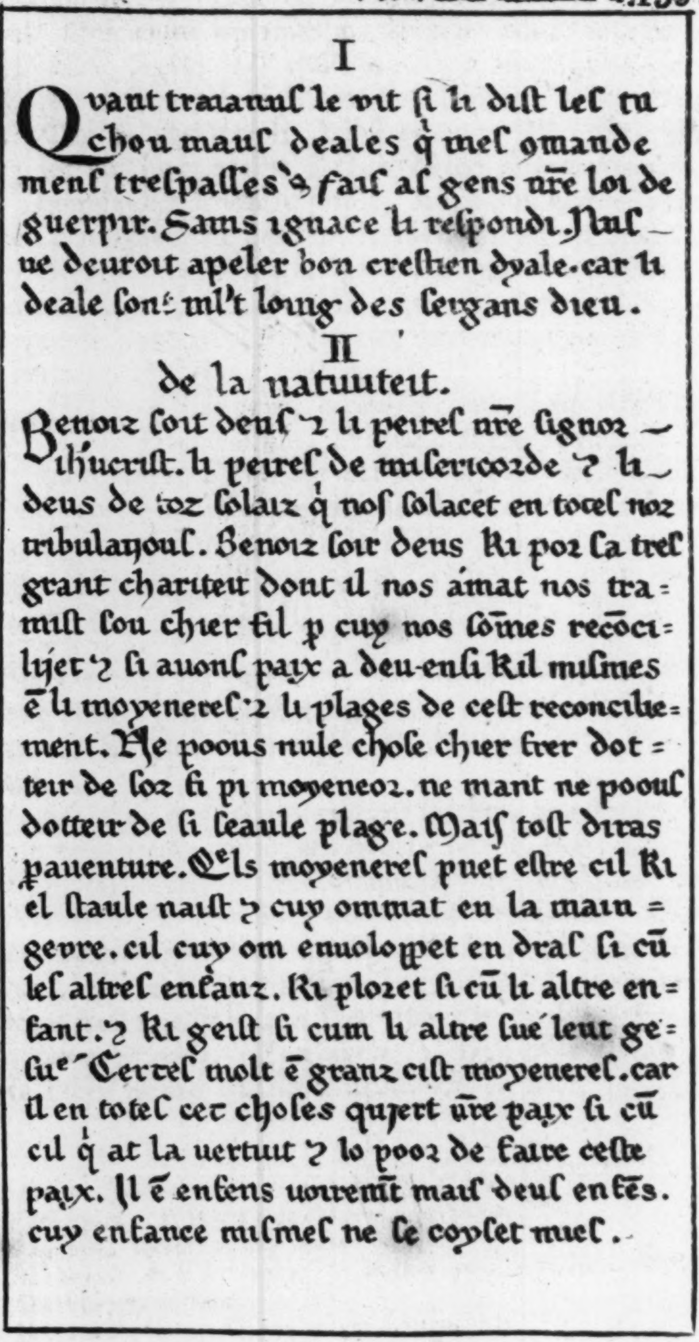

I

Qvant traianuſ le vit ſi li diſt leſ tu
chou mauſ deales q̇ meſ ꝯmande
menſ treſpaſſes ⁊ faiſ aſ gens nr̄e loi de
guerpir. Sains ignace li reſpondi. Nuſ —
ne deuroit apeler bon creſtien dyale. car li
deale ſont ml't loing des ſergans dieu.

II

de la natiuiteit.

Benoiz ſoit deuſ ⁊ li peireſ nr̄e ſignor —
iħucriſt. li peireſ de miſericorde ⁊ li —
deus de toz ſolaiz q̇ noſ ſolacet en toteſ noz
tribulacionſ. Benoiz ſoit deus ki por ſa treſ
grant chariteit dont il nos amat nos tra=
miſt ſou chier fil p̄ cuy nos ſom̄es recōci=
lijet ⁊ ſi auonſ paix a deu. enſi kil miſmes
ē li moyenereſ ⁊ li plages de ceſt reconcilie=
ment. Ne poons nule choſe chier trer dot=
teir de ſoz ſi pi moyeneor. ne mant ne poonſ
dotteir de ſi ſeaule plage. Maiſ toſt diras
p̄auenture. Qels moyenereſ puet eſtre cil ki
el ſtaule naiſt ⁊ cuy ommat en la main=
geure. cil cuy om enuoloppet en draſ ſi cū
leſ altreſ enfanz. ki ploret ſi cū li altre en=
fant. ⁊ ki geiſt ſi cum li altre ſuelent ge=
ſire. Certeſ molt ē granz ciſt moyenereſ. car
il en toteſ ceſ choſes quiert nr̄e paix ſi cū
cil q̇ at la uertuit ⁊ lo poor de faire ceſte
paix. Il ē enfens uoirem̄t maiſ deuſ enfēs.
cuy enfance miſmeſ ne ſe coyſet mueſ.

‘Deu (*o*) . . . . & Dex ne le connoit à ſon Fis (*p*) par le
‘ peichiè où li deable la mis & trabuichié et enlacié
‘ (*q*), *&c.*’

The WRITING and LANGUAGE *of the* XII *and* XI CENTURIES.

I. *An Extract of the* Life *of St.* IGNACIUS Biſhop *of* Antioch.

AMONG a great many other Lives of the moſt eminent Saints, written in *French* in the twelfth Century, and preſerved in a very fine Manuſcript on Parchment, in the Library of *Sarbonne*; you will find at the End of it theſe Words written in the ſame Hand as the Work.

Anno Domini, M°. CC°.

‘ Quand Trajanus le vit (*a*) ſi li diſt. Les tu chou maus
‘ deales (*b*) qui mes commandemens treſpaſſes, et fais as
‘ gens (*c*) notre loi deguerpir? Sains Ignaces li reſpondi.
‘ Nus (*d*) ne devroit apeler bon chreſtien Dyale. Car li
‘ deale ſont molt loing des ſergans (*e*) Dieu. Mais por-
‘ che que j'ai fait as (*f*) deales maint ennui, et qu'il me
‘ heent (*g*), mas tu apelé diale. Je ne ſuis mie diale.
‘ Ainſi croi et aoure (*n*) Jheſu Criſt le roy del ciel et de le
‘ terre.

(*o*) *Fis Deu*; *Fils de Dieu*, Son of God.

(*p*) *Et Dex ne le connoit à ſon Fils*; *Et Dieu ne le connoit pas pour ſons fils*; Nor does God acknowledge him for his Son.

(*q*) *Trabuichié & enlacié*; *Fait tomber, & pris dans ſes lacèts*; Cauſeed him to fall into his Snares.

(*a*) *Le vit*; Saw Biſhop *Ignatius*.

(*b*) *Les tu chou maus deales*, &c. *Es tu ce mauvais eſprit qui tranſgreſſe mes Commandements*; Art thou that evil Spirit which tranſgreſſes my Commandments? *Maus* is derived from *malus*, which was at that Time pronounced, *Mals*. *Deales* or *Diales* from *Diabolous*.

(*c*) *As gens*; *Aux hommes*, Men. Ibid. *Deguerpir*, *Abandonner*; To forſake.

(*d*) *Nus*, *Nullus*, *Perſonne*; No-body.

(*e*) *Des ſergans Dieu*; *de ceux qui ſervent Dieu*; Of thoſe who ſerve God.

(*f*) *As Deales*; *Aux Diables*; to the Devils.

(*g*) *Il me heent*; *Ils me haiſſent*; they hate me.

(*b*) *Aoure*, Adore.

‘térre.. Trajanus lis diſt. Qui eſt qui bons Chreſtiens eſt. Sains Ignaces li reſpondi. Cil qui Jheſu Criſt a ades (*i*) en ſon cuer. Trajanus diſt. Il ne teſt mie avis que nos aions bons Dex (*k*) qui ſi bien nos aident en nos battailles & contre nos ennemis. Sains Ignaces li reſpondi. La foloies (*l*) tu molt durement, (la où) tu quides que les imaiges des gens ſoient Dieu. Car il n'eſt que uns ſeus (*m*) Dex. Ceſt cil qui fiſt le chiel & le tere & le mer, & quanques (*n*) i a. & Jheſu Criſt eſt ſes fix (*o*) cui ames j'ai conquiſe (*p*). Trajanus diſt. Lis tu celui Jheſu qui fu crucefiés au tans de Pilate le prevoſt. Sains Ignaces li reſpondi. Chelui di je qui le pechié crucefia & chelui (*q*) avec qui tu as pechié. Trajanus diſt. Portes tu donc celui Jheſu Criſt en ton cuer. Sains Ignaces li reſpondi. Oui. Car il meiſmes dit en l'Eſcripture. Je manrrai (*r*) en ciax qui en moi creront, & qui me ſerviront & irai avec iaus là où il iront. Lors regarda Trajanus ſes chevaliers & ſi lor diſt. Prenes moi Ignaces ſi le me faites mener à Rome tout loié de fer. Car par che qu'il diſt qu'il porte Jheſum (*s*) qui fu crucefiès, le ferai je mangier as beſtes ſauvaiges devant tot le peuple.

‘Quant Sains Ignace oï ce ſi eut molt grant joie & diſt à haute voix. Sire Jheſu Criſt je te rends grace de che que tu m'apeles entierement à t'amor (*t*), & de chou que je ſui dignes que je ſoie loiés de fer pour ti.

II. *An*

(*i*) *Ades, Toûjours*, Always.

(*k*) *Que nos aions bons, Dex*; *des Dieux bienfaiſans*, bountiful Gods.

(*l*) *La foloies tu*; *En cela tu te trompes, tu extravagues*; In this thou art miſtaken, thou raveſt.

(*m*) *Seus*, ſolus,

(*n*) *Quanques*, quodcumque.

(*o*) *Ses fix, ſon fils*, His Son.

(*p*) *Cui ames j'ai conquiſe*; *Auquel j'ai acquis pluſieurs ames*; to whom I have won many Souls,

(*q*) *Chelui avec qui tu as pechiè*; He with whom thou haſt ſinned; the evil Spirit.

(*r*) *Je manrrai en ciax*; *Je demeurerai en ceux, &c.* I ſhall remain in thoſe who, *&c.*

(*s*) *Il porte Jheſum.* This is the ſame Termination as in the above Piece of Poetry extracted out of the Hours of the Paſſion.

(*t*) *A t'amor*; *A ton Amour*, to the Love of thee.

II. *An Extract of the Tranſlation of the Sermons of St.* Bernard, *that was made in the Time of this holy Doctor, or little after his Death.*

The Manuſcript on Parchment is in the Library of the *Feuillans* * of the Place *de Louis le Grand. De la Nativitet.*

‘ Benoit ſoit Deus & li peres notre Signor Jeſu Chriſt,
‘ li peres de miſéricorde & li Deus de tos Solals (*a*) qui
‘ nos ſolacet (*b*) en totes nos tribulations. Benoit ſoit
‘ Deus Ki por ſa tres grant chariteit dont il nos amat nos
‘ tranſmit ſon chier fil, par cui nos ſomes reconciliet, &
‘ ſi avons paix à Deu (*c*): enſi Kil miſmes eſt li moyeneres
‘ & li plages (*d*) de ceſt reconciliement. Ne poons
‘ nulechoſe (*e*), chier frere, dotter deſor ſi pi moyeneor *(f)*.
‘ Ne mant ne poons dotter de ſi feaule plage (*g*). Mais
‘ toſt diras par avanture, quels moyeneres puet eſtre cil
‘ Ki el ſtaule (*h*) naiſt, & cui om mat (*i*) en la maingeure
‘ (*k*). Cil cui om envoloppet en dras, ſi com les
‘ altres enfans. Ki ploret ſi cum li altre enfant, & Ki
‘ geiſt ſi cum li altre Suelent (*l*) geſir. Certes molt eſt granz
‘ ciſt

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* Monks of the Order of St. *Bernard*.

(a) De tos ſolais; *de toute conſolation*; of all Comfort, from the *Latin* ſolatium.

(b) Nos ſolacet; *Nous conſole*, comforts us.

(c) A Deu, *Avec Dieu*, with God.

(d) Li moyeneres & li plage: De mediateur & la garant; the Mediator and the Guarantee. *Moyeneres* and *moyencor* are ſynonymous, like *pecheres* and *pecheor*.

(e) Ne poons nule choſe; *nous ne pouvons nullement*, we cannot upon any Account.

(f) Dotter deſor ſi pi moyeneor: douter, ètre inquiets, ſous un ſi pieux, ſi affectionnè médiateur, doubt, or be uneaſy, under ſo pious and affectionate a Mediator.

(g) Ne mant ne poons dotter de ſi feaule plage; *nous ne pouvons non plus héſiter-ayant une ſi fidele caution*; Nor can we heſitate and be ſtaggering, having ſuch a faithful Surety. *Mant* is no more than an adverbial Connexion, which together with *ne* anſwers the *Latin* neque. *Feaule* and *feal* ſignifies *fidele*, faithful.

(h) El ſtaule, *dans une étable*, in a Stable.

(i) Om mat; *on mèt*, one puts.

(k) En la maingueure; *dans une mangeoire*; in a Manger.

(l) Suelent geſir; *ſolent jacere*, uſe to lie down. Moſt of theſe Words are but an ill pronounced *Latin*.

ciſt moyeneres. Car il en totes ces choſes quiert notre paix, ſi cum cil qui at la vertuit & lo poor de faire cette paix. Il eſt enfant voirement, mais Deus enfans cui enfance miſmes ne ſe coyſet mie (m).'

In order to judge the better of the *French* of this Age, let us compare what we have juſt ſeen with the *French* of St. *Bernard* himſelf. As he was born in the Year 1091, and had already made great Progreſs in the religious Life in the Year 1113; 'tis likely he had in his Retirement kept the Language of the eleventh Century, together with that of the Beginning of the twelfth. He both preached and wrote in *Latin:* So that this total Separation from the World was not very proper to poliſh the *French* he had never learned but in his Infancy. We muſt find his Language in Reality rougher than all we have ſeen. But we ſhall ſtill find there the Grounds of our Language, which was now ſettled.

An Extract of the Letter of St. Bernard, *to his Friend* Raymond, *Knight Lord of* Châtel-Ambroiſe, *concerning the Government of his Family**.

'Gracieus et bien heureis en fortune et richeſce Raimond chevalier ſires dou Chaſteil-Ambroiſe. Bernard demenés (*a*) ou temps de villece (*b*) ſalut, demandei aiz à nous de eſtre enſignez de la cuſanſon (*c*) et de la meniere de plus profitablement governeir les choſes et chevances (*d*) familieres, et comment li peire de la magniée (*e*) qui eſt chief et gouvernour de l'Oſteil ' (*f*)

(*m*) *Cui enfance miſmes ne ſe coyſet mie*; *de qui l'enfance memes n'eſt pas muette, mais plûtôt éloquente,* whoſe very childhood is not mute, but rather eloquent. *Se tenir cois, ſe coiſer,* ſignifies to be ſilent, to be quiet: All from the *Latin* quietus.

* See *Bibliotheca Bibliothecar*, of *D. Bernard de Montfaçon*, vol. ii. p. 1384.

(*a*) *Demenés*; *Parvenu,* arrived at.

(*b*) *Ou temps de villece*; *Au temps de la vieilleſſe*; at the Time of old Age.

(*c*) *Demandei aiz*; *tu as demandé, &c.* Thou haſt deſired us to inform thee. *De la cuſanſon, de curatione, de l' adminiſtration*; of the Management or Government.

(*d*) *Chevances*; *Biens,* Fortune.

(*e*) *Magniée*; *Famille, en y comprenant les eſclaves*; one's Family, the Slaves included.

'(*f*) ſe doit avoir maintenir. A quoi nous te repondons que ja ſoit ce que toutes choſes mondaines et leſtait (*g*) et liſſue de toutes beſognes (ſoient) labourouſſes de ſous fortune (*h*), ne doit on mie pour ce laiſſier la reigle de vivre.'

Comment on doit faire les diſpens (*i*).

'Eſcoute et te prens varde (*k*) que ſe en tai maiſon, les deſpens et revenues ſont egualz, cas et avenue ſoubdains, dont on ne ſe prend varde, porroit deſtruire ton eſtait. L'Eſtait de l'ome negligent, c'eſt une Maiſon, ruineuze. Queſt ce negligence de celhui qui governe l'oſteil? C'eſt une grant feu forment embraſeiz.'

De ceux qui adminiſtrent & traitent les biens & diſpenſent.

'Diſcute etrevarde diligemment lour diligence et lour cuſanſon, de queil propos ils ſont en admiſtrant tes biens. Cellui qui dechiet de ſa chevance et dechiet aidez (*l*) et encor n'eſt dou toute point déchevancies ne cheus. C'eſt moins de honte pour lui de eſcharſement vivre et abſtenir, que de tous poins cheoir en povretet. De très ſouvent compteir les tiennes choiſes, eſt grant prudence et ſagace.'

Dou gouvernement des bêtes.

'Conſidere et penſe, de lai paſture et dou boire pour tes beſtes. Car par naiture elles ſont fameleuſes, et point ne'en demandent.'

Com-

(*f*) *L'oſteil*; *l'hôtel, la maiſon*, the Houſe.

(*g*) *Leſtait*, *L'etat*, the Situation, the Duration.

(*h*) *Labourouſſes do ſous fortune*, uncertain, wavering, unſteady: *Incertains et chancelants par les accidens qu'on appelle de fortune.*

(*i*) *Deſpens*; *la depenſe*, the Expence.

(*k*) *Varde*; *Garde*, Care.

(*l*) *Cellui qui dechiet de ſa chevance et dechiet aidez*, &c. *Celui qui déchoit de ſa proſpérité, mais qui eſt ſecourou dans ſa chute, on ne peut pas dire qu'il ſoit ruiné ni tombé. (Il a ſa reſſource dans ſon économie) et il lui ſera moins honteux de vivre avec beaucoup d'épargne que de, &c.* He that falls from his Proſperity, but is aſſiſted whilſt he is decaying, cannot be ſaid to be ruined or depreſſed. (His Oeconomy is his Reſource) and it will be leſs Shame to him to live very ſparingly than, &c. ibid. *Eſcharſement*, with Parſimony. *Avec épargne*; *Eſcharceté*, a very ſmall Expence.

Comment ſe doiƈt faire deſpens de nopces.

‘ Noces ſomptueuſes & de trop grans deſpens donnent
‘ & apportent damaige ſenz honnour.

Des Deſpens.

‘ Deſpens faiz pour Chevalerie eſt honorables. Deſpens
‘ faiz pour aidier à ſolz larges (*m*) ſont perdus.

De glotenie.

‘ La maſniée tu dois norrir de groſſes viandes, non
‘ mie delicieuſes. Car quicunques eſt glouton (*n*) á peine
‘ ſeroit il jamais autrement que avec la mort. Tel mours
‘ de glotenie ne changeroit. Gloutenie eſt li pourriture
‘ dou vil & négligent home. Li mangier, de l'ome cu-
‘ ſanſons & diligent eſt ſolais. En jours Paſquieres &
‘ halz & annalz (*o*) doies repaiſtre & norrir ta maſniée
‘ habundamment, non mie deliciouzement.

De avarice & eſcharceteit.

‘ Fait ta bource pladier à ta goule (*p*), & te pren
‘ bien garde de cui & pour qui tu ſeraiz advocas. Et ſe
‘ il avient que entre la goule & la bource tu ſoies juges,
‘ le plus ſouvent non mie pour lai goule, mais pour lai
‘ bourſe rens & donne la Sentence. Car li goule ſi (*q*)
‘ prueve

(*m*) *Aidier à ſolz larges*; *ſecourir des incenſes qui prodiguent ce qu'ils ont*, To aſſiſt extravagant Squanderers.

(*n*) *Quicunques eſt glouton, &c. Celui qui eſt glouton à peine ſeroit-il jamais autre que ce qu' il devient après la mort : & à peine la mort fera-t-elle en lui quelque changement. Cet homme eſt après ſa mort ce qu'il étoit auparavant ; Car la gloutonnie fait une vraie pouriture d'un homme ſans elevation & ſans ordre ; Au contraire les rojouiſſances & les repas de l'homme laborieux & aƈtif ſont l'addouciſſement ou le ſoutien de ſon travail.* Whoever is a Glutton, can hardly be any Thing more than what Death will make him; it will hardly work any Change in him. He is after Death all he was before; for Gluttony makes true Carrion of a mean-ſpirited diſorderly Man; whereas the Rejoicings and Feſtivals of an aƈtive and laborious Man are both an Alleviation and an Encouragement of his Labour.

(*o*) *En jours Paſquieres, & halz & annalz*; *aux jours de Pâques, aux hautes ou principales fetes, & aux rojouiſſances legitimes qui reviennent d'année en année, &c.* In the *Eaſter* Holy-days, *&c.*

(*p*) *Fait ta bource plaidier à ta goule*; Make thy Purſe plead againſt thy Mouth, and hear the Arguments of both; but take Care for which of the two thou ſhalt declare.

(*q*) *Li goule ſi prueve par*, &c. *Si*, is a Connexion very frequent in our ancient Language, and ſtill much ſo in that of many of our Provinces. But, this *French* Particle is only for the Ear, and makes no Senſe

‘ prueve par affection ſon deſir & entention, ne ſes teſmoignages point ne jure de verités dire. Mais li bourſe prueve ſon intention évidemment & deuement par la huge (*r*), par la voie (*s*), par lou greniers, par lou celier, qui de tous biens ſont veudies; ou en briefs temps ſeront veudies. Adont (*t*) tu plaidies mal & aprement encontre la goule quant avarice clot la bourſe. Jamais l'avarice juſtement & droitement ne jugeroit entre la goule & la bourſe: & quelle choſe eſt avarice? C'eſt li murtriere d'elle meiſme: qu'eſt-ce avarice? Doubte povretei (*u*), & en vivant en povretei vi li aveirs (*x*) en ſoi, ſenz point perdre ſes richeces. Mais ſouvent avient que il garde auz autres. Mieulz vault (*y*) aſſeiz gardeir auz aultres, richeces, que de les perdre en lui meiſme.

De ton bleit (z)

‘ Se il avient que tu aies habundance dou bleit, ne aime ne ne deſire chartei, car al qui couvoite & deſire le chier temps, convoite & deſire eſtre homicide & murtrier de povres gens. Vent ton bleit quant il eſt a ſouffiſant pris, & non mie quant li povre n'en puet achateir. A tes voiſins ven lou a mainre (*a*) prix &

‘ auſſi

Senſe of itſelf. This is the Meaning of this Phraſe. The Mouth, by a quick and paſſionate Senſe, gives Proofs of what it deſires and aſks for. (Its Proceeding is a Motive for miſtruſting it.) For the Witneſſes, it produces to ſpeak in its Behalf, take no Oath to ſpeak the Truth. But the Purſe proves what it advances, and that by regular and evident Means. What it ſays is made good by the Pantry, the Granary, and the Cellar, which are actually empty, or will ſoon be ſo.

(*r*) *La huge. La huche.* The Pantry. *Le garde-manger.*

(s) *Par la voie.* I don't underſtand this Word. Poſſibly it might be the Proviſion of Wood, from the Word *Veha*, a Cart-load.

(*t*) *Adont tu,* &c. But thou pleadeſt wrong and hard againſt the Mouth, when it is Avarice that ſhuts the Purſe. Avarice will never judge with Equity, &c.

(*u*) *Doubte povretei.* A Fear or Suſpicion of Impoveriſhment.

(*x*) *Vi li aveirs en ſoi.* The Miſer lives apart and by himſelf. He is centered in himſelf.

(*y*) *Mieux vaut aſſez garder aux autres,* &c. It is better not to keep ſo many Riches in Store for others, than deny the Uſe of them to one's ſelf.

(*z*) *Bleit. Blo.* Corn.

(*a*) *Mainre, Moinder.* Leſs.

'auſſi a tes anemis. Car on ne vain mie adeiz (*b*) ſon 'anemie par glaive, mais ſouvente foix par boire et par 'mangier et aultre ſervice, &c.'

A great many monuments of the common Language of the thirteenth Century, and a few of the twelfth, may be ſeen in the ancient common Law-books of our Provinces, eſpecially in thoſe of *Champagne* and *Beauvoiſis*; in the Statutes and Regulations that were eſtabliſhed or reformed for Handicrafts and trades, by *Stephen Boileau*, Provoſt of *Paris*, an excellent Magiſtrate, well worthy of the Choice St. *Lewis* had made of him. The Copies of them may be ſeen in the Office of the Rolls of the *Châtelet*, and in the Library of the *Sorbonne*. You will find other Monuments of the *French* of theſe two Ages, in the Statutes of our Kings of the third Race, collected by Mr. *de Lauriere*, among which you will ſee a great many of St. *Lewis* himſelf, and one of *Lewis* VII, ſurnamed the Young, 1168; in a great many public Regulations, Letters, Contracts of Marriage, and other Pieces of the great Collection of Dom. *Edmond Martenne*. The Rev. Father *le Long*, in his *Bibliothêque Françoiſe* and the *R. F.* Dom. *Bernard de Montfaucon*, in his Library of Libaries, point out to us a great many Manuſcripts which may inlighten the Hiſtory of our Language.

The WRITING *and* LANGUAGE *of the* IX *and* X CENTURIES.

De impari Numero ejuſque diviſione.

Impar quoque numerus, qui à paris numeri, *&c*,

THIS is extracted from the Treatiſe of Arithmetic of *Boecius* and has no difficulty in it for the Reading, any more than what follows: There want only

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(*b*) *Adiez. Toûjours.* Always. *On ne remporte pas toûjours la victoire ſur ſon ennemi, &c.* One does not always get the better of an Enemy, *&c.* I omit, though with Reluctance, the reſt of this Letter, which is full of Meaning, and where the utmoſt Skill may be ſeen for the Management even of temporal Affairs. The ſame Ingenuity is found again in the Convents of the Order of St. *Bernard*, where the Spiritual is beſt ſupported of any.

I

DE IMPARI NUMERO EIUSQUE DIVISIONE.

Impar quoq; numeruſ. qui a pari numeri natura ſubſtantiaq; diſiunctuſ e÷. ſiquidem illem g̃mina acqua diuidi poteſt. hic neſecari — queat unitatiſ impedit intr̄uentuſ. t̄reſ hab& ſimilit̄ ſubdiuiſioneſ.

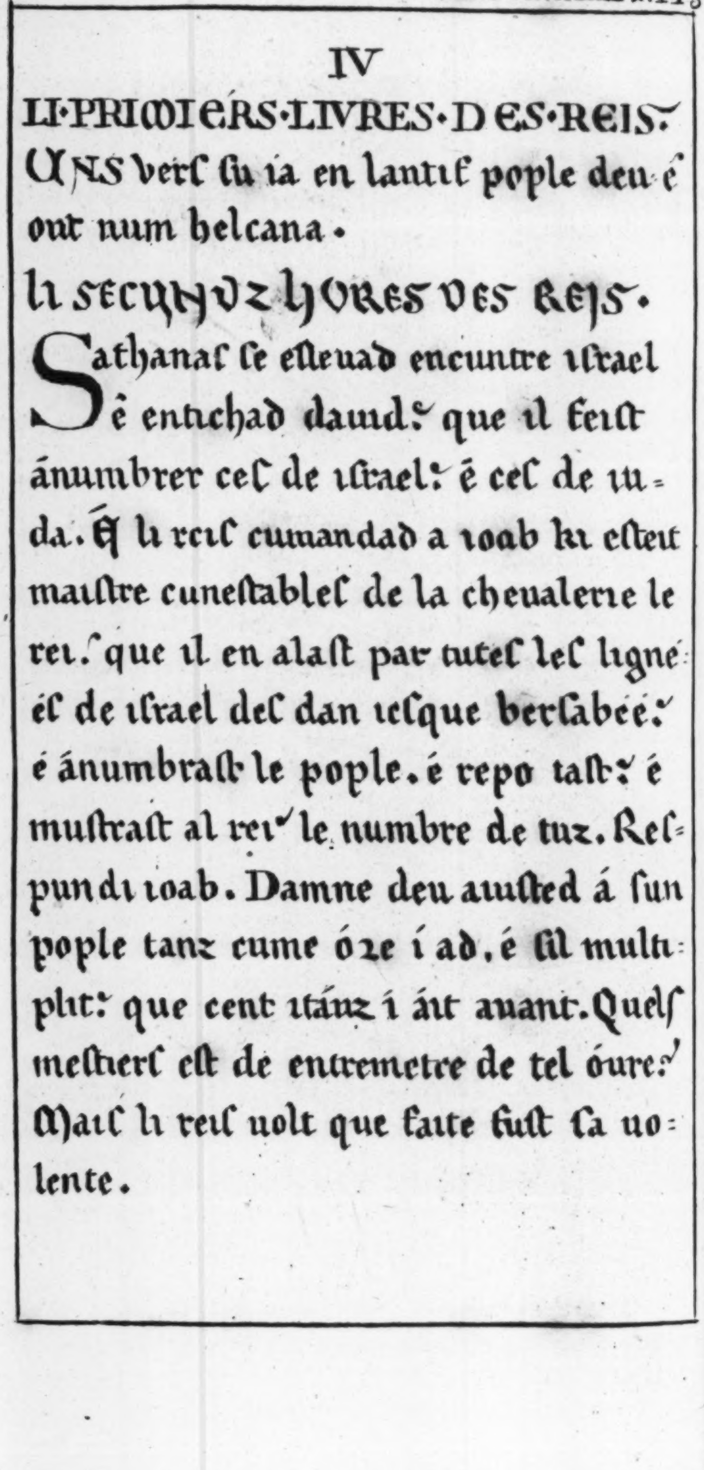
II

Suſcipe dn̄e animā ſerui tui LOTHARII. In bonū Libera dn̄e animā ei ex. omnibuſ periculiſ Inferni & de laqueiſ penarū ex om̄ib; tribulationib; tartari. Lib̄a dn̄e animā ei ſicut Liberaſti. Enoch & Eliā de cōmuni morte mundi & ſicut Liberaſti Loth de ſodomiſ & de flamma igniſ.

III

VULPIS AD PERSONĀ TRAGICAM.

Perſónam tragicam forte util pir uiderat o quanta ſpecieſ inquit cerebrum Non hab& hoc illiſ dictum eſt quibuſ honorem & gloriam fortuna tribuit ſenſum comniunem abſtulit.



IV

LI·PRIMIERS·LIVRES·DES·REIS·

UNS verſ ſu ia en lantif pople deu· é
out num helcana·

li ſecundz liures des reis·

Sathanaſ ſe eſleuad encuntre iſrael
é entichad dauid: que il feiſt
ánumbrer ceſ de iſrael: é ceſ de iuda.
É li reiſ cumandad a ioab ki eſteit
maiſtre cuneſtableſ de la cheualerie le
rei: que il en alaſt par tuteſ leſ lignées
de iſrael deſ dan ieſque berſabée:
é ánumbraſt le pople. é repo taſt: é
muſtraſt al rei le numbre de tuz. Reſpundi
ioab. Damne deu auiſted á ſun
pople tanz cume óze i ad. é ſil multiplit:
que cent itánz i áit auant. Quelſ
meſtierſ eſt de entremetre de tel óure:
Maiſ li reiſ uolt que faite fuſt ſa uolente.

only our Spaces between the Words and our Pointing, the Invention and Uſe of which are of very modern Date. The full Stop alone is ancient for both its Invention and Practice. But there are ſeveral Pieces of Writing in which the full Stop itſelf is omitted. Theſe three Extracts of ſo many Manuſcripts on Parchment of the Library of St. *Remi* of *Rheims*, have been communicated to me by *Dom la Vacher*, Librarian of that Abby. I. The firſt is ſeven hundred Years old. II. The ſecond is almoſt eight hundred, and has been the Pſalter or Prayer-book of Queen *Emme*, Wife to *Lotharius*, the laſt King but one of the ſecond Race, who is buried in the Choir of St. *Remi*. III. The laſt is the Manuſcript of the ninth and tenth Century, which ſerved to give the Public *Phædrus*'s Fables. The *Belles Letters* were cultivated in the Schools of this Abbey, and that of the Cathedral, whilſt Ignorance was ſpreading all the World over. The ſame Schools were ſtill more eminent in the following Age, under the Scholaſter *Gerbert*, who became Pope, and took the Name of *Sylveſter* II.

Such is the Writing of the eleventh and tenth Centuries. We find both their reſpective Language and Writing united in a very fine Manuſcript on Parchment, kept in the convent of the R. F. Cordeliers of *Paris*. It is the famous Tranſlation of the four Books of Kings, which our Antiquarians, and Mr *le Buef* in particular, confidently refer to the Eleventh Century, as its lateſt Date, both for the Letter and Diction. The Tranſlation of the Books of the *Machabees*, which is at the End of the ſame Volume, is poſterior to the foregoing by two hundred Years. This aſſemblage, imperfect as it was, yet was precious at that time, and one of the Ornaments of the Library of a Queen of *France*.

‘ IV. Li primiers livres des Reis.

‘ Uns vers fu ja en lantif pople Deu, e out num
‘ Helcana. *Unus vir fuit*, &c. En l'antif, *that is, in the*
‘ *ancient People of God*, dans l'ancien peuple de Dieu, &
‘ il eut nom, Helcana, *&c. and his Name was* Helcana,
‘ *&c.*’

‘ Li ſecunds livres des Reis.

‘ Sathanes ſe eſlaved (*Satan roſe againſt*, &c.) encuntre Iſrael, e entichad David (*perſuaded or ſuggeſted to David*) que il feiſt anumbrer ces (ceux, *thoſe*) de Iſrael e ces de Juda; e li Reis cumandad à Joab ki eſteit Maiſtré cuneſtables de la chevalerie le Rei (du Roi, *of the King*) que il en alaſt par tutes le lignées (familes *Families*) de Iſrael des Dan jeſque Berſabée (*From* Dan *near Mount* Libanus, *quite to* Berſabee *toward* Egypt) e anumbraſt le pople, e reportaſt, e muſtraſt al Reile numbre de tus. Reſpondi Joab. Damne deu ajuſted a ſun pople tans come ore i ad (*Let the Lord God add as many to his People as there are now*) ſil multiplit (*and let them multiply it to ſuch a Degree*) que cent itans i ait avant (*that they may be hereafter an hundred times as many as before*) Quels meſtiers eſt de entremettee de tel ovre ? (*What need is there of undertaking this Work?* Mais li Reis volt que faite fuſt ſa volenté.

Dom. *Bernard de Montfaucon* placed in the Beginning of the ſame Century the Writing of the Manuſcript of Mr. *Colbert*, now in the King's Library, Numb. 3133. It is the Tranſlation of the Symbol attributed to St. *Athanaſius*, and the ſureſt Specimen we can poſſibly produce of the *French* Language, as it was ſpoken in the tenth Century.

‘ Kikumkes vult Salf eſtre, devant totes choſes beſoing eſt qu'l tienget la commune fei.

‘ Laquele ſi caſk un entiere é neent malmiſme (*a*) ne garderats ſans dotance pardurablement perirat.

‘ Iceſte eſt à certes la commune fei que uns Deu en Trinitet é la Trinitet en unitet aorums (*b*).

‘ Ne mie confundanx le perſonnes, ne la ſubſtance deſeuranz (*c*). Altre eſt à decertes la perſonne del Perre, altre del Fils, altre del Saint Eſpiriz.

(*d*) *Neent*. *Neant*. *Non*, *nullement*. No. *Malmiſme*, is the Latin *male-miſtam*, mingled, altered. *Neent mal miſme*, inviolable.

(*b*) Aorums. *Adoremus*. *Veneremur*, as they ſaid *aornes* from *adornatus*.

(*c*) *Deſeuranz*. The ſame Thing as *ſevrant* (dividing) or *ſeparant*, ſeparating.

‘ Mais

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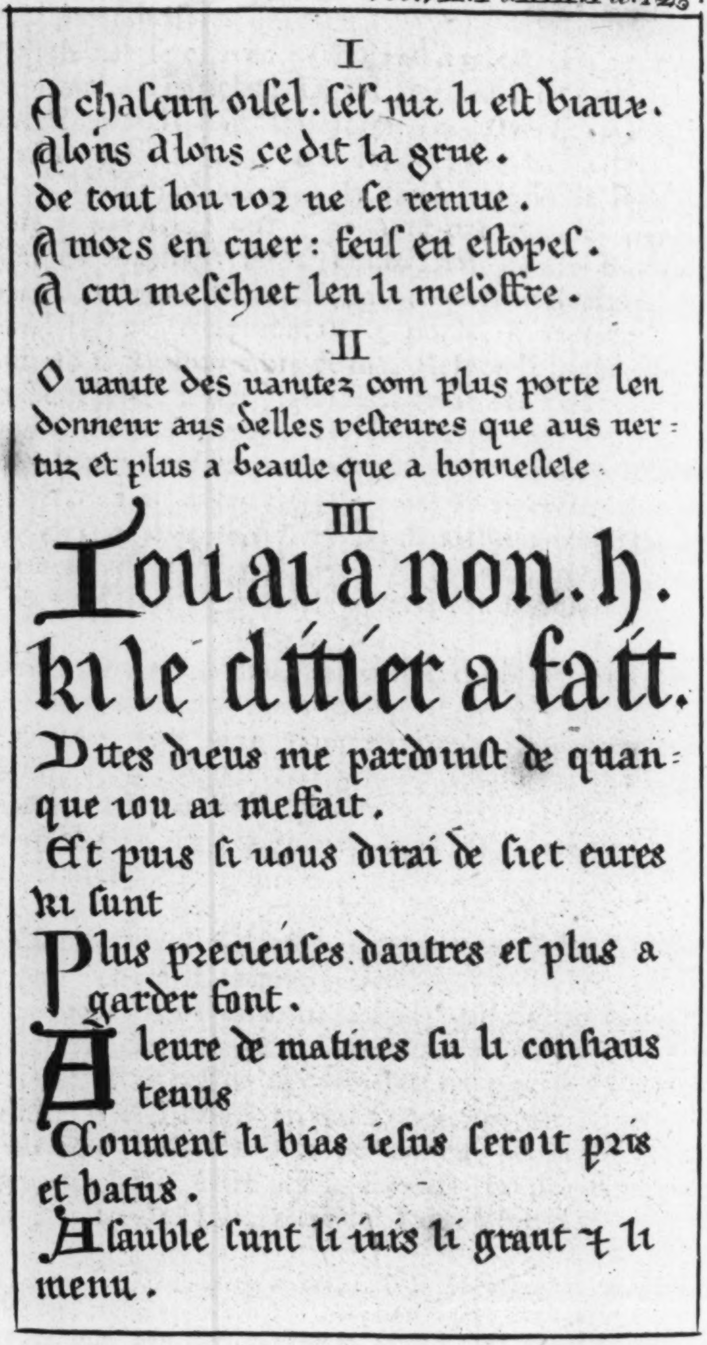

I

A chaſcun oiſel. ſeſ nir li eſt biaux.
Alons alons ce dit la grue.
de tout lou ior ne ſe remue.
Amors en cuer: feuſ en eſtopeſ.
A cui meſchiet len li meſoffre.

II

O uanite des uanitez com plus porte len donneur aus belles veſteures que aus vertuz et plus a beaute que a honneſtete.

III

Iou ai ā non. h.
ki le ditier a fait.

Dites dieus me pardoinſt de quanque iou ai meſfait.
Et puis ſi uous dirai de ſiet eures ki ſunt
Plus precieuſes. dautres et plus a garder ſont.
A leure de matines ſu li conſiaus tenus
Coument li bias ieſus ſeroit pris et batus.
Aſauble ſunt li iuis li grant ⁊ li menu.

‘ Mais del Perre é del Fils é del ſaint Eſpiriz une eſt divinitet, oele *(d)* gloire, pardurable Majeſtet.

‘ Quels eſt li Perre, tels eſt li Fils, tels li Saint ‘ Eſpiriz.

‘ Neent criez *(e)* eſt li Perre, neent criez li Fils, neent ‘ criez li Saint Eſpriz. Granz eſt li Perre, granz eſt li ‘ Fils, granz eſt li Saint Eſpiriz.

‘ Pardurables li Perre, pardurables li Fils, pardurables ‘ li Saint Eſpiriz.

‘ Nequedent *(f)* ne ſunt mie treis pardurables, mais ‘ un pardurable.

‘ Si cum ne ſunt treis nient criez, ne treis granz, mais ‘ uns nient cries é uns granz.

‘ Enſement *(g)* treſtut-poant *(h)* li Perre, treſtut poant ‘ li Fils, treſtut poant li Sainz Eſpiriz.

‘ E nequedent ne ſunt tres treſtut poant, mais uns ‘ treſtut poant.

‘ Iſſi faiterement *(i)* Deus eſt li Perre, Deus eſt li ‘ Fils, Deus li Sainz Eſpiriz.

‘ E nequedent ne ſunt treis Deus, mais uns Deus ‘ eſt. &c.

To underſtand this ancient Tranſlation, it ſuffices to compare it with the *Latin,* from which it hardly differs at all in a great many Places, except in point of Pronunciation.

See the reſt of this Symbol in the Ruſtic or *Roman* Language, in the laſt Volume of the Works of St. *Athanaſius*'s Edit. of the *Benedictins* Monks. Although the Spelling of thoſe Ages is irregular, and the Copiſts do not always keep to an exact Uniformity: nevertheleſs, it is not on Account of any Neglect of theirs, that we ſee ſo many Words terminated by an *s* or a *z*, which we no longer put at the End of them, ſuch as *crèes*, *pardurables*, *Sainz*, *eſpiriz*. *Creés* reſembles the *Latin creatus* much more than *créé*. Pardurables reſembles *perdurabilis*,

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(*d*) *Oele*. Æqualis.

(*e*) *Neent criez*. *Non créé*. Not created.

(*f*) *Nequedent*, nec tamen, *ni cependant*. Not yet.

(*g*) *Enſement*. *Ainſi*, *Semblablement*. Likewiſe.

(*h*) *Treſtut poant*. *Tout-puiſſant*. Almighty.

(*i*) *Iſſi faiterement*, *Ainſi réellement*, &c. And ſo really, *&c.*

uns reſembles *unus*, and *Sainz* reſembles *Sanctus*, or *Santz* according to the current Pronunciation. *Eſpri*, as we now pronounce it, is not ſo nearly like *Spiritus* or *eſpirits* (as it was then pronounced) as the Word *eſpiriz*. It is the *Latin* itſelf. The laſt Words we have copied, *ne ſunt treis Deus, mais uns Deus eſt*, what are they elſe than mere *Latin* Words?

Theſe few Specimens ſuffice to make us ſenſible how our Language gradually confounds itſelf, and is ſwallowed up into that which it is but an Alteration of. When we go back as far as the tenth Century, and higher, although the Romance, or the *Roman* vulgar Language, was already formed; yet there are hardly any coherent or at all extenſive Monuments of it to be found. All was then written in *Latin*. We only meet here and there with a few Words of that vulgar *Latin*, which is our *French*, intermixed with the *Latin* Words, in the Laws, public Acts, and Books of thoſe Times. But, inſtead of more conſiderable Monuments, we find the primitive Form of our vulgar Language again in that of *Provence*, and of our other Southern Provinces. Notwithſtanding the ſeveral Idioms that have been occaſioned there by the Reſidence of the *Bourguignons* and other Nations in *Provence*, of the *Viſigoths* in *Languedoc*, and of the *Spaniſh* Mountaineers in *Gaſcony*, it is always from the ſame Grounds. It is an ill conſtrued and ill pronounced *Latin*. That Southern Language generally called *Provençal*, notwithſtanding the Variety of Accents in the Dialects of *Gaſcony*, *Languedoc*, *Auvergne*, and *Provence*, is not different in its Origin from our modern *French*. Its having preſerved a greater Conformity with *Latin*, is becauſe *Latin* was originally more common in the South of *France* than on this Side the *Loire*. Our Southern Provinces have for a conſiderable Time been Eſtates diſtinct and ſeparate from *France*. Beſides, the Northern Provinces have always ſtudied and endeavoured to imitate the Language of the Court and the Metropolis, which ſeemed to grow politer every Day, by the Reforms which the *beau Monde* and the Learned introduced into it from one Age to another.

Blazonry, which took its Birth from the Tournaments of the middle Age, and its Perfection in the Cruſades, has, as well as Hunting and Falconry, preſerved to this Time Part of our vulgar *French*. We have alſo other Means left of finding again the Terms and Turn of our ancient Mother-tongue, in the very Diſorder of the *Latin* of the middle Ages, by going back to the ſet Forms of *Marculphius*, who lived in the eight Century, to the two *capitular Decrees* of the Kings of the ſecond Race, to the Laws of the ſeveral *French* Tribes, and to thoſe unformed Acts mixt with *Latin* and Romance, which we find among the Proofs of the Hiſtory of *Languedoc*. The Unexactneſs obſervable there, as to the Structure and Choice of the Words, as well as of the Gender, has its Source from the Habit they had contracted of commonly ſpeaking a *Latin* that was disfigured by popular or foreign Phraſes. Neceſſity had obliged the *Gauls* and the *Francs* to expreſs their own Thoughts in broken *Latin*. But they all did it according to the Genius of their ancient Tongues, the *Celtic* or the *German*, without obſerving the Regularity of the Compoſition, or the Diſtinction of Caſes or Genders, ſubſtituting every now and then to the *Latin* Terms, thoſe of the *Gallic* Tongue, and of the *Lingua Franca*, or *Tedeſca*, that is, of the *German*, together with other Words of the *Gothic* Language and that of *Burgundy*. This has produced that *Ruſtica Romana*, the moſt ancient known Remains of which is of the ninth Century *; *viz.* the Oath of the two Armies of *Charles* the *Bald* and *Lewis* of *Germany*, which begins with theſe Words: *Por Deu amor, & por Chriſtian poblo, & noſtro commun Salvament.* We omit the Reſt, which *Fauchet* and moſt of our Hiſtorians have preſerved, and quoted from *Nithard*.

We have alſo another Monument, which ſeems to be of the ſame Date, *viz.* The Epitaph of *Bernard*, Duke of *Septimania*. If we will credit the Chronicle of *Odo Aripert* †, and agreeable in this Repect to the Annals of *Motz* and *Fuld Charles* the *Bald*, in the Year 844, killed this Duke with his own Hand, after a Peace reſpectively ſworn and ſigned by both Parties with a Pen dipt in the precious Blood of *J. C.* The Duke's Body was left two Days unburied, and then interred, by *Samuel* Biſhop of *Toulouſe*, with this Inſcription in Romance: *Cum hac inſcriptione in Romancio:*

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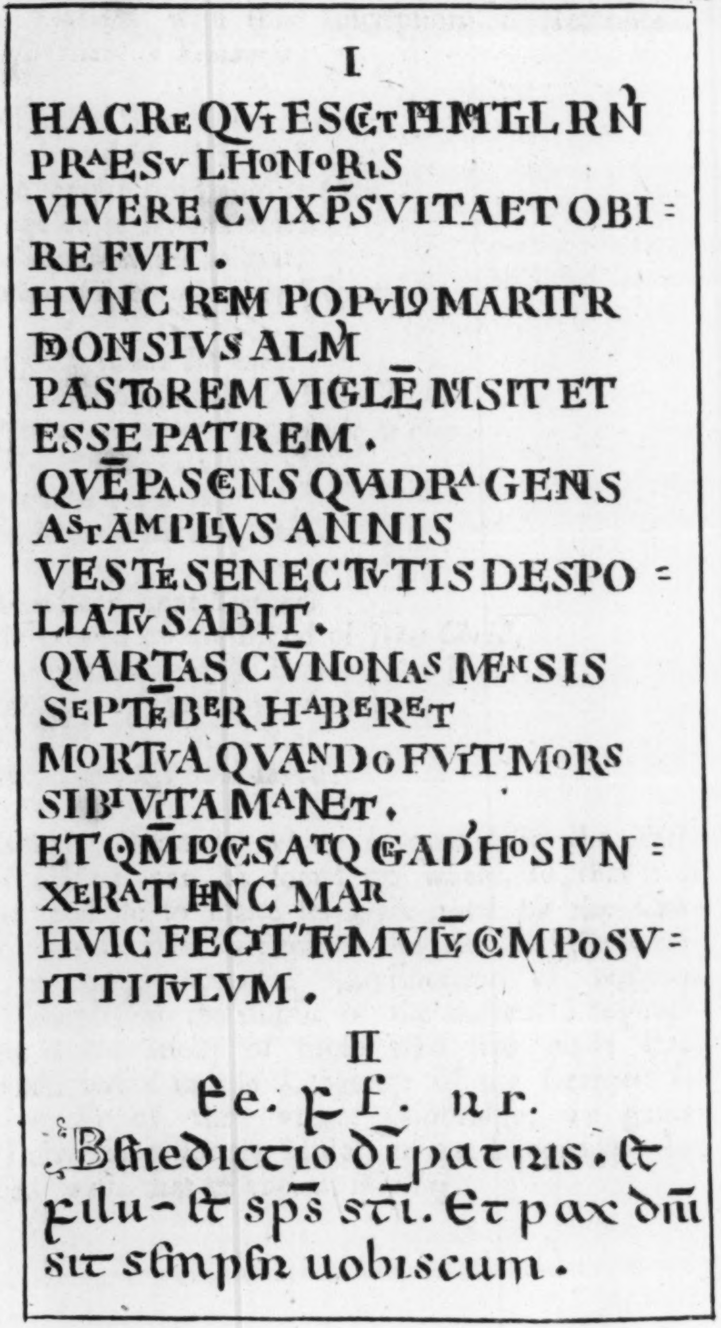
† See the Hiſtory of Languedoc. Vol. I. The Proofs, p. 53.

Aſſi jay lo Comte Bernard,
Fis el credeire al Sang Sacrat,
Que ſempre prud'hom es eſtat.
Pregu'en la Divina bontat,
Qu'aquela ſi que lo tuat,
Poſqua ſoi arma' haber Salvat.

Ici git le Comte Bernard.
Il prouva par le ſang de Jeſus Chriſt,
Qu'il avoit toújours ètè homme de bien.
Prions la Divine bonté
Que celui qui le tua,
Puiſſe avoir ſon ame ſauvé.

Here lies Count *Bernard.*
He proved by the Blood of *Jeſus Chriſt*,
That he had always been a good Man.
Let us pray the Divine Goodneſs
That he who killed him,
May have his Soul ſaved.

But as this Chronicle, which is quoted in the Antiquities of *Caſtres*, can be found no where, ſo that it is no longer poſſible to make its Date good by the Character, or from other Particulars, this may be apprehended to be ſome rhetorical Amplification of poſterior Times, though in the Goût of the ancient Language. Nay, the *Latin* itſelf, of thoſe who had made ſome Studies, and wrote in the Language of the Learned, ſavouring much of their vulgar Gibbridge, we gather from it Inſtructions for the Hiſtory of our Language. Let us proceed with that of ancient *Writing*.



I

HACREQVIESCIT HMTLRN
PRAESVL HONORIS
VIVERE CVI XP̄S VITA ET OBI=
RE FVIT.
HVNC REM POPVLO MARTIR
DIONISIVS ALM
PASTOREM VIGLĒ MISIT ET
ESSE PATREM.
QVĒ PASCENS QVADRAGENIS
ASTAM PLVS ANNIS
VESTE SENECTVTIS DESPO=
LIATVS ABIT.
QVARTAS CV NONAS MENSIS
SEPTĒBER HABERET
MORTVA QVANDO FVIT MORS
SIBI VITA MANET.
ET QM LOCVS ATQ EAD HOS IVN=
XERAT HINC MAR
HVIC FECIT TVMVLV CMPOSV=
IT TITVLVM.

II

Ee. ꝑf. nr.

Bñedictio dī patris. & filii. & sp̄s sc̄i. Et pax dñi sit sēmp̄ uobiscum.

The WRITING *and* LANGUAGE *of the* IXth CENTURY.

I. THIS fine Monument of the ninth Century is ingraved upon a Stone a Foot and a half ſquare, under the Lobby of St. *Remi* of *Rheims*, and was ſent me by Mr. *Batteux*. The Method of intermixing ſmaller Letters with large ones, as is done here, is very common in the Inſcriptions in the ninth, tenth, and eleventh Centuries. *Tilpin*, of whom this Monument is the Epitaph, had been taken from the Abbey of St. *Denys* in *France* in the Reign of *Charlemaign*, to be made Archbiſhop of *Rheims:* Which is enough to underſtand the 3d and 4th Verſes. The 7th and 8th ſignify that he died on a *Friday*, the 4th of *September*. The 9th and 10th, & *quoniam locus atque gradus hos junxerat*, &c. ſignify that *Hincmar* who had been taken out of the ſame Convent, and made Archbiſhop of the ſame Place, had built a Tomb to *Tilpin*, and wrote the Inſcription over it. This has remained legible and intire to this Day.

II. The Bleſſing, which follows, is borrowed from a Prayer-Book in *Saxon* Characters of the Library of *St. Remi*. It ſeems to have been uſed by *Tilpin*, or rather by *Ebbon* his Succeſſor, who has made ſeveral Miſſions in *Saxony*, and among other Northern Nations, who made uſe of the *Saxon* Character, and the *Muſcovite* or *Sclavonian* Writing. It is the Opinion, that from the ſame *Ebbon* we had that ancient Collection of Epiſtles and Goſpels in *Sclavonian* Characters, which our Kings formerly laid their Hands upon, when they at their Coronation ſwore to do Juſtice, and preſerve every one his Right. They now uſe, on theſe Occaſions, the Book of the Goſpels in the current Letter.

The WRITING *and* LANGUAGE *of the* VIII, VII, VI, *and* V CENTURIES.

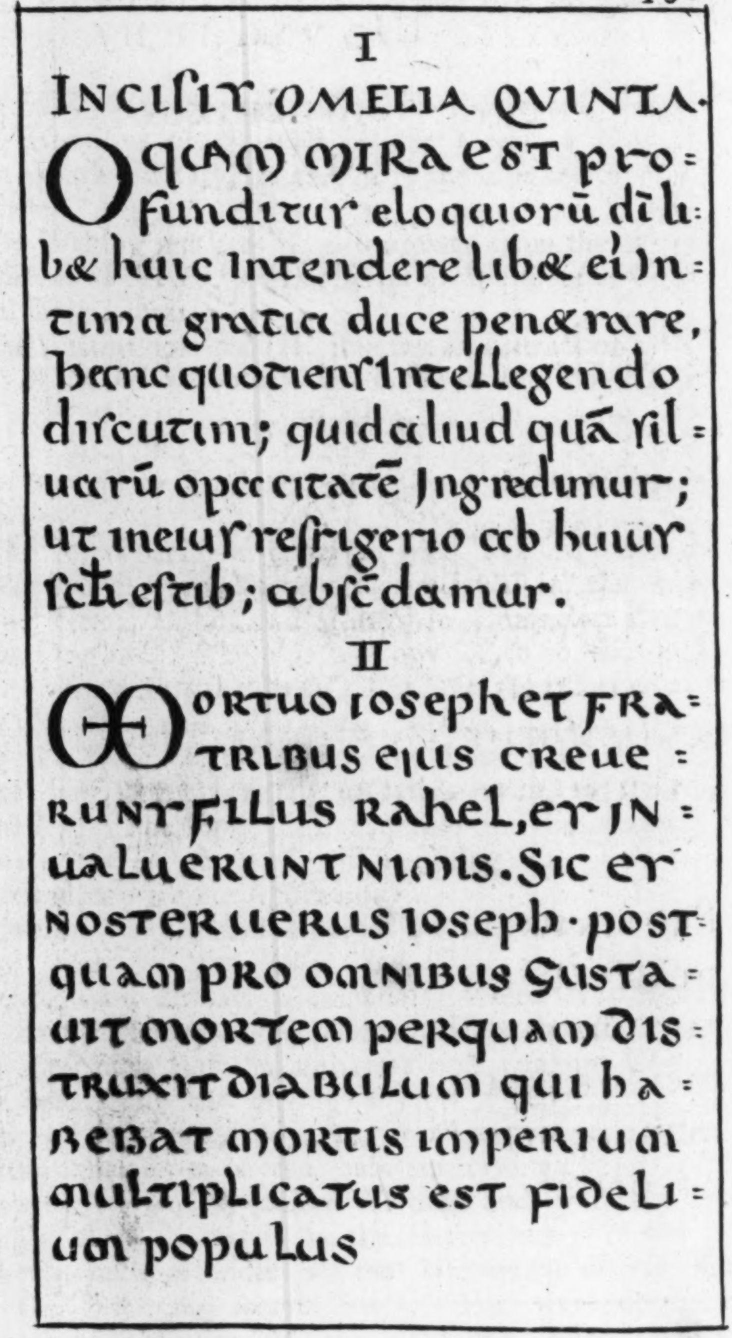
THE Writing marked I. is borrowed from the Homilies of St. *Gregory* the Great, a Manuſcript of the eighth Century, preſerved in the Library of St. *Remi* of *Rheims*.

The Writing marked II. is borrowed from the Works of St. *Iſidorus* of *Seville*, a Manuſcript of the ſeventh Century, in the ſame Library.

The Writing marked III. imitates an Extract of a Manuſcript of the ſixth Century, preſerved in the Royal Library at *Turin*, which ſerved to give us the Edition of the Divine Inſtitutions of *Lactantius*, printed at *Paris* for *John Baptiſte de l'Eſpine*. After *non* is underſtood *ſibi vindicavit*.

The laſt Specimen is of a very fine Manuſcript of *Virgil*, above 1300 Years old, preſerved in the Library of the Grand Duke, and printed in Characters like thoſe of the Original. There is a Copy of it in the Library of St. *Germain dez Prez*. For the Regularity of the Printing, they caſt Characters perfectly equal: We give here the three Verſes where the Letters of the Manuſcript have been exactly imitated, even in their Uneveneſſes. The only Care requiſite in the reading of Manuſcripts, is that of diſtinguiſhing the End of the Words which are not ſeparated.

Coming to the firſt Ages of the Church, and the foregoing, we find the *Latin* and *Greek* Inſcriptions, the Medals, and all the Monuments, which are Matter of the fineſt Literature. We have indeed infinite Helps in this Reſpect. But the univerſal and conſtant Complaint has been, our not having a ſhort Paleography, which being of itſelf no Study, nor at all expenſive, might accuſtom the Eyes to the habitual diſtinguiſhing of the Alphabet of each peculiar Writing, and gradually make People more dexterous in the decyphering of the moſt difficult, ſuch as thoſe of the Diplomata of our Kings of the firſt and ſecond Race. For want of this firſt Branch of Erudition, a very ſlight one, indeed, and very eaſily acquired, we find ourſelves ſtopt ſhort every

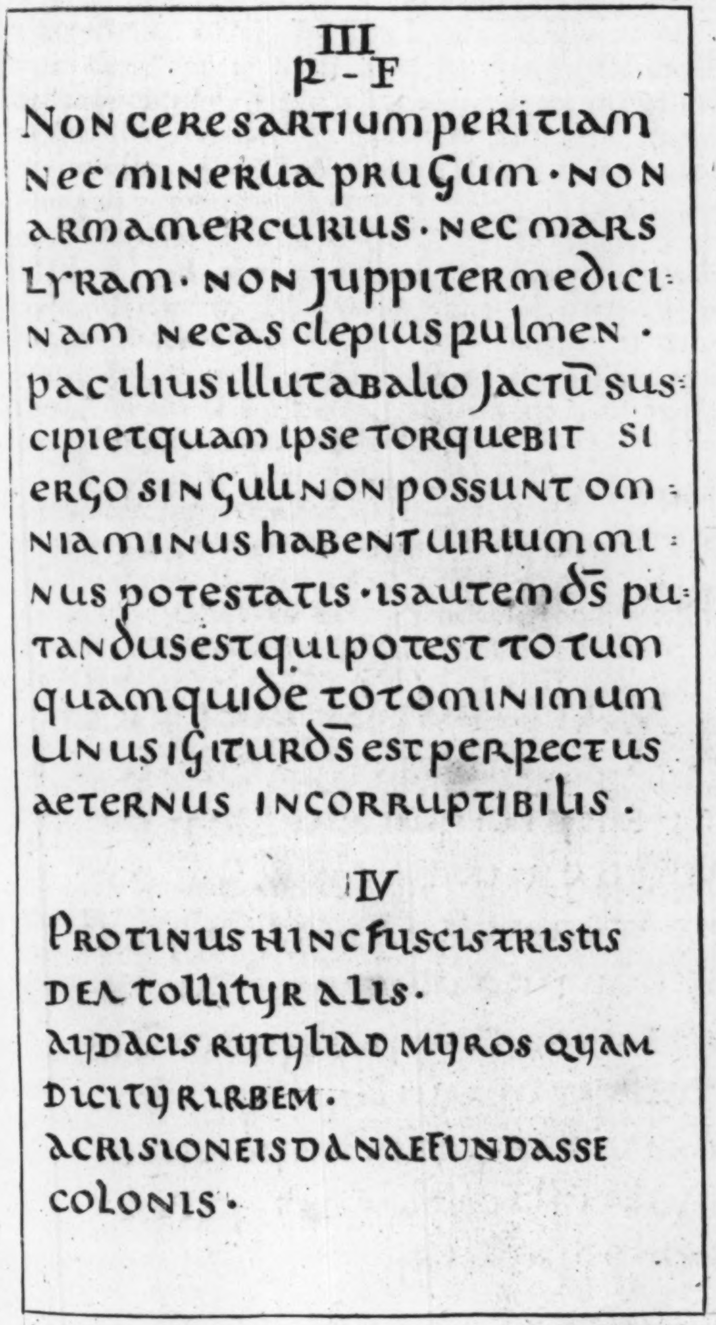


I

INCIPIT OMELIA QUINTA.
O quam mira est pro=
funditur eloquiorū dī li=
b& huic intendere lib& ei in=
tima gratia duce pen&rare,
hecnc quotiens intellegendo
discutim; quid aliud quā sil=
uarū opacitatē ingredimur;
ut in eius refrigerio ab huius
scli estib; abscdamur.

II

MORTUO IOSEPH ET FRA=
TRIBUS EIUS CREUE=
RUNT FILLUS RAHEL, ET IN=
UALUERUNT NIMIS. SIC ET
NOSTER UERUS IOSEPH · POST=
QUAM PRO OMNIBUS GUSTA=
UIT MORTEM PER QUAM DIS=
TRUXIT DIABULUM QUI HA=
BEBAT MORTIS IMPERIUM
MULTIPLICATUS EST FIDELI=
UM POPULUS



III

R - F

Non ceres artium peritiam
nec minerua prugum · non
arma mercurius · nec mars
lyram · non juppiter medici:
nam nec asclepius pulmen ·
pacilius illu tabalio jactū sus:
cipiet quam ipse torquebit si
ergo singuli non possunt om:
nia minus habent uirium mi:
nus potestatis · is autem d̄s pu:
tandus est qui potest totum
quamquide toto minimum
Unus igitur d̄s est perpectus
aeternus incorruptibilis .

IV

Protinus hinc fuscis tristis
dea tollitur alis ·
audacis rutuli ad muros quam
dicitur urbem ·
acrisioneis danae fundasse
colonis ·

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where. The Sight of a Manuſcript frightens us; and Characters, which, in Truth, are hardly at all different from ours, appear to us moſt ſhockingly obſcure. When, on the contrary, we have once rendered ourſelves Maſters of the firſt Avenues by means of this Key, then, indeed, are we for prying into every Corner. Such are the ſlight Beginnings which we have firſt by way of Amuſement, Play, or Diverſion, and afterwards by a regular and certain Method, led our celebrated *Du Cange*, *Mabillon*, *Baleuſe*, *Longuerue*, *Montfaucon*, and *le Beuf*, to ſo many happy Diſcoveries, in the Monuments of the learned Antiquity, as well as in thoſe of the Middle-age, where the Originals of our Tongue and Cuſtoms, of our Laws and our greateſt Intereſts, are to be found.

The Art of writing with Notes.

The *Romans* had another Method of communicating their Thoughts to Poſterity. I mean the Art of Writing with Notes, ſo very compendious and ſhort, that a Regiſter in a Court or any where elſe could write the Demands and Anſwers, or any other Diſcourſe, as quick as it was uttered. The Tongue and Hand went the ſame Pace. The Uſe of theſe Notes has ſubſiſted among us even very far in the ninth Century, and was loſt in the Darkneſs of the following Age, when the current Writing was hardly cultivated. An Antiquarian, full of Courage and Ingenuity, has lately had a few Specimens of theſe ancient Notes ingraved (a), in hopes of reviving the Practice of them, or of facilitating the underſtanding the Pieces of this kind of Writing, which are found again in ſome Libraries.

(a) Paris. Chez les Freres Guerin.

DIALOGUE XXI.

The third Sequel *of* INSTRUCTIVE ARTS.

AMONG the Arts which afford us Inſtruction, there are a great many whoſe Operations are always performed under our Eyes. There are others which ſhew us their Productions only, whilſt their mechanical Part keeps at a Diſtance from us, and ſeems to avoid being ſeen. I mean thoſe large Works in Caſt-iron, which the Fear of Accidents by Fire commonly cauſes to be executed at a Diſtance, or the Undertaking of which is not often repeated; but which ſtir up our Curioſity by the very Difficulty of the Execution. Such is the Bell, which has, for ſo long a Time, been the Signal of Chriſtian Congregations, and the large brazen Statue, which is the moſt ſignificative, as well as the moſt durable of the Monuments of paſt Events. Of theſe we may conſider both the Uſe and Work ſingly.

The Uſe of large brazen Pieces.

The Uſe of theſe Inſtruments is very different from what we take it to be, and they both ſpeak many more Things than they really ſeem to do. The brazen Figures on Horſeback which have been erected, one in the Place of *Lewis* the Great, at *Paris* *, the other in the *Guild-Hall* at *Bourdeaux,* are they deſtined merely to ſhew Strangers, and tranſmit to Poſterity the Features of *Lewis* XIV and XV? They are indeed at once Teſtimonies of the loyal Affection and good Taſte of both theſe Towns. The Names of *Girardon* and *le Moine,* are become as indeſtructible as theſe Monuments, and the bare Inſpection of theſe magnificent Models will ever perpetuate the

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* The Place de Vendoſme.

Induſtry of the Artiſts. The Figure of *Betrand du Guéchlin* and that of Marſhal *de Turenne* give us ſome Idea of thoſe Men whom we love, though we never ſaw them, and, together with the Marks of their Dignity, are Hints to us of the moſt memorable Facts of their Hiſtory. But, do they teach us nothing else? Placed as they are, near the Tombs of our Kings, they inform us of the tender Gratitude of *Charles* the Wiſe and *Lewis* XIV, for their faithful Servants. Is it poſſible our Nobility can any where find more powerful Inticements than thoſe to the Love of public Good and ſolid Glory?

The Hiſtories of the Martyrs, and all the Monuments ſtill extant, both in Stone and Braſs, of the unſhaken Conſtancy of the Witneſſes of Truth, do not only acquaint us with the Kinds of Tortures they were made to ſuffer, and the Veneration ſtill had for Virtue, after ſo many Ages, but inform us of ſomething ſtill more intereſting. The admirable Concert of theſe with other Monuments of all Sorts, which are diſperſed all over the Earth, make, in favour of the Eſtabliſhment of our Religion, a luminous Croud of Atteſtations, a Correſpondency of Acts, and a mutual Guaranty of Truth, not to be met with in the Proofs of the moſt inconteſtable profane Hiſtories.

It is the ſame Thing with the Signal of Prayers, when it notifies the Celebrating of *Eaſter*, or the Manifeſtation made to the *Gentiles*, or the generous Confeſſion of any Martyr. This Signal does more than barely publiſh a religious Meeting: It is the Memorial of an Event which our Forefathers have been affected by: And the faithful Returns of the ſame Jubilations hand down to every Year the Teſtimony of the foregoing, inſomuch that the actual Solemnity is the Extremity of a Chain, which unites and links eighteen Ages together. The Deiſt, who hears the Publication of theſe Feaſts, calmly looks at thoſe who reſort to them, and calls them Idiots and Fools: For his own Part, the Superiority of his Penetration has freed him from a Subjection that would confound his Reaſon with that of the Vulgar. But, if he is any otherwiſe judicious, this is what he may very well ſay to himſelf when he makes a Schiſm with thoſe, who ſtill continue the ſame Practice at hearing the Publication of the Common prayers.

I forbear aſſiſting at the Aſſemblies which this Voice calls me to. But cannot I look upon myſelf, in this Reſpect, as one duly mindful of his own Intereſt? Far from running any manner of Riſk in approving of them by my Preſence, the Things heard, and the Sentiments inculcated there, cannot but be uſeful to Mankind. The Creator is praiſed in theſe Congregations, and thanked for all the Bleſſings he daily beſtows upon us. As for us Deiſts, we are in this perfectly like the Ox and the Horſe, who have no Feaſts to ſolemniſe, becauſe they have no Thanks to give, nor any Favours to expect: And we ſhould be far better pleaſed to hear the Bell for the opening of the Public Baths, as it was the Cuſtom among the Heathens *(a)*, than hear that which calls us to a Solemnity appointed to render us better.

And, indeed, were the Paſtor, who preſides over our Chriſtian Aſſemblies, as mute as a Fiſh, the Office he celebrates is intelligible to every one who will liſten to it, and whatever this Office inſinuates, as well as what the Miniſter's Voice can add to it, is a preſſing Invitation to the Practice of all the mutual Helps that may be inſpired by fraternal Love. The very Name of the Solemnity publiſhed by the Bell, is an Inſtruction, a Motive of Gratitude, and a Model of Charity. The Tendency of what is ſaid or practiſed there, is to perſuade my Wiſe to be of help to me in every Thing; my Son and Daughter, to ſtrive to pleaſe me by their Love for Labour and good Manners; and my Domeſtics to ſerve me with Affection. They are even taught, that all the Good they ſhall do without Affection, will avail them nothing *(b)* and that it is Love alone that can fulfill the Law. If whatever breathes around me can be brought to the Practice of Charity, which is the ſtanding Object of theſe Feaſts, I ſhall have no Occaſion to find fault with them, but when I am unruly myſelf, and no longer able to bear with what condemns me.

(a) Sonat æs thermarum.

(b) 1 Cor. xiii.

But I cannot find in my Heart to govern my own Conduct upon mere Intereſt. It is not enough for me, that the Feaſts, to which I am invited, be fit to render Men ſociable and obliging; I would have Truth be the Foundation of them, and the Facts related as well as the Bleſſings promiſed to me, be of the utmoſt Certainty. What other Rule have I to go by but my own Reaſon? And how can I give my Approbation to Feaſts that ſhock my Reaſon! But, ought not my Reaſon, on the other Hand, to be ſatisfied with Proofs that are Matters of Fact? And can it think itſelf much clearer-ſighted in its own philoſophical Aſſertions? What Things do we perſpicuouſly conceive, when they bear no longer any Relation to Numbers, Meaſures, and the firſt Duties of Humanity.

Does not the *Newtonian* Syſtem, which has now the greateſt Authority among ſo many ſublime Genius's, on Account of its geometrical Apparatus, require the Sacrifice of our own Reaſon? We muſt be over credulous, to eſtabliſh at the Center of our Sphere a luminous Body, emitting and diſperſing all round, from one Moment to another, a Subſtance always freſh, ſucceſſively and uninterruptedly extending itſelf to Hundreds of Millions of cubic Leagues. Where can the Sun get this frightful enormous Maſs of an ever-renewed Subſtance; and what can become of it, after it has been thus emited? Incarnation, on the contrary, is poſſible: It is my greateſt Intereſt that it ſhould be true, and if it is moreover aſcertained by Fact, my Reaſon ought to be fully ſatisfied.

The Reaſon of ſo many other Men, who have admitted the Incarnation of the Divine Word as an unqueſtionable Truth, muſt needs have been ſhocked as well as mine, by that Part of it which is difficult to comprehend, and they, indeed, acknowledge that this their Belief at firſt Sight looks like Madneſs; but that what made them yield to it, notwithſtanding their natural Reluctance, was, their being ſtruck, and as it were forced into this Perſuaſion, by the ſenſible Motives of a Divine Revelation, ſuperior to all human Reaſonings; as it muſt be left to the Will and Pleaſure of God, to adapt himſelf to our Weakneſs and Infirmities, and to regulate his

Conduct towards Man as he thinks proper. It is then perfectly needleſs to me to arm myſelf, as I uſually do, with a hundred Objections, that can neither alter nor deſtroy the Facts, and to dive into the Poſſibilities of Seduction, if, on the other Hand, there are Proofs of a Revelation. This is the Point to be examined. Let us follow the Thread of the Objects which are offered to us, and ſee how far it will lead us into Truth; obſerving, at the ſame Time, never to depend upon any Account whatever on rational Evidence, which we find ſo liable to change, and ſo frequently deceitful, but ſolely to build upon experimental Evidence, which is juſtified by a Croud of evident Facts.

The vaſt Extent of thoſe Feaſts I am invited to, firſt intimates the Remoteneſs of their Antiquity. It is a known Matter of Fact, that the Towers of the Church of *Notre Dame* of *Paris*, and the Signal given there for Divine Service are ſix or ſeven hundred Years old at leaſt, and that this Edifice, is but the Renewal of another, which had Towers and a public Signal like theſe. The Front-gate and Tower of St. *Germain de Prez* are almoſt twelve hundred Years old, and the Building of them goes back quite to the Time of the Children of *Clovis*. The whole Southern Part of *Europe* is full of Eſtabliſhments contemporary to thoſe I have juſt mentioned, and even of a more ancient Date, where the ſame Practices are found again. Towers to ſupport and render the Inſtrument of Convocation audible from afar off: A large Building for the Reception of the People; A Chancel that ſeparates them from the Clergy; a Pulpit, to ſpeak to the Faithful: A Scripture loudly read before them, and unalterable: A baptiſmal Font, an Altar, and a Paſtor. All theſe things are ſtrictly united in Antiquity, as they are at preſent. They mutually explain each other, and all of them conduce to one and the ſame End. But if all theſe Things have always been in Company for thirteen or fourteen hundred Years together, what now ſtrikes our Ears and Eyes was then practiſed above fourteen hundred Years ago; and when, reciprocally, I find again a Front-gate and a Steeple to call the People together, I muſt then needs ſay, that there were alſo at thoſe Times, and in that Place, the Font, the Altar, the Paſtor, the

Goſpel, and the Belief of the Incarnation. All this is utterly indiviſible.

When we go higher in Antiquity, and ſearch the Monuments of the Ages foregoing as to the Uſe of our Signal, the Towers deſtined to give it are no longer met with: We then find Times of Storm and Perſecution. The Publications and Public Buildings being forbidden at thoſe Times, we muſt not expect to find again the Veſtiges of them ſo eaſily. But they are replaced by other more numerous, brighter, and more inſtructive Monuments, than Walls and Steeples can by their Deſtination be. The Places, eminent by the Effuſion of the Blood of the Martyrs, are become Places of religious Meetings, and have once been turned into ſo many Temples; ſometimes into large Habitations, and into famous Towns. In the Aſſemblage of all the Chriſtian Monuments, we every-where find the ſame Ideas, Names, Uſes, and Inſtruments. We, indeed, cannot ſhew the Buildings, nor the Signal which brought the Faithful of the firſt Ages together: But by the Books, Feaſts, and all the Cuſtoms which have been uniformly handed from thoſe Times down to ours, we again find a perfect Uniformity in the reſt. A Pulpit, a Scripture, a Font, an Altar, a Paſſover, a Pentecoſt, an Epiphany; the ſame Solemnities, the ſame Offerings, the ſame Repaſts, and the ſame Paſtors as we have at preſent. The Invitation, which I now decline to accept of, is then a Reproach to me of having forſaken Aſſemblies and Cuſtoms of ſixteen or ſeventeen hundred Years old. It reproaches me with the ſtrange Temerity of rejecting Solemnities as ancient as the Facts they are appointed to publiſh, and of daring to ſtile falſe Evidence the Depoſition of the Diſciples, who died on purpoſe to atteſt the Things they had ſeen.

But, how! Have not the Trumpets, which publiſh the Feaſt of the *Hegyra* among the *Arabians*, perpetually handed down from Year to Year the Knowledge of one ſingle Fact, without, however, eſtabliſhing the Truth of *Mahometiſm?* The Uniformity of the Celebration of the *Hegyra* among the *Muſſelmen*, has undoubtedly very well aſcertained the Flight of *Mahomet*, proſecuted by the Magiſtrate of *Mecca*, and obliged to take his Refuge at *Medina*. It is the ſame with the annual uninterrupted

Celebration of the Death of the Forerunner of Chriſt, of the Death of Chriſt himſelf, and his Martyrs. The Facts, thus uniformly atteſted by ſolemn univerſal Feaſts, are unqueſtionable on both Sides. This conſtant Fidelity among ſo many different Nations, in repeating the ſame Solemnities from Year to Year, makes us as ſure of the Events celebrated, as though they were but Yeſterday. The Trumpet, which has not, for ten Ages together, ceaſed from Year to Year to publiſh the *Hegyra* among the *Arabian*, *Perſian*, and *African Mahometans*, reminds every one of them of the Time of that Flight. When likewiſe the Bell publiſhes among us the Solemnity of the Martyrs, the Impreſſion ought to be the ſame as if their Blood had been juſt now ſhed. But let the Flight of a Man, proſecuted by the Magiſtrate, be ever ſo certain, there reſults nothing from it in favour of the Miſſion he attributes to himſelf, and celebrating the *Hegyra* is rejoicing about nothing. The *Mahometan* Feaſts are Publications of needleſs Facts, as the heatheniſh Solemnities were of Facts mutually deſtructive of each other: Whereas praiſing the Martyrs, and celebrating their Memory, which have ſo generally, and ſo tenderly, been honoured by the firſt Faithful, in going with them purpoſely to collect the Blood and Aſhes of thoſe who died merely to certify that their Belief was no Opinion, and that what they publiſhed was no more than what they had heard, ſeen, and touched. It is jointly collecting with them, and handing down the moſt ſhining Proofs of the Truth of Chriſtianity. Nay, the very Exceſſes, into which Ignorance has ſometimes run in this Reſpect, do ſuppoſe the Reality of the Reverence that preceded them.

If the Deiſt, inſtead of impoſing upon himſelf by a metaphyſical Sophiſtry, which makes what he wiſhes appear true, would fairly own what he cannot but perceive, and thoſe Conſequences reſulting from innumerable Evidences of the ſame Truths, the Signal of our Prayers, far from filling his Heart with Sadneſs and Inquietude, would raiſe Sentiments of Joy and Hope: He would faithfully attend thoſe Feaſts, of the Utility of which he is ſenſible, even in ſpight of himſelf, and honour thoſe reverend Aſſemblies, which, being by an uninterrupted Chain connected with the firſt days of Chriſtianity, do not only recall, but truly demonſtrate the Facts to us.

Our Books, clothed with caſt Covers and Figures, our Baptiſmal Fonts, our large Chandeliers, and all our modern Inſtruments, prove to be like others which are of a Date more ancient than even that of our very Temples. The Deſtination of both the latter and the former is the ſame. They are a Language not liable to any Variation. All thoſe large Veſſels of Caſt-iron, which the Church imploys in her Service, are equally, though differently, conducive to our Inſtruction. Beſides the Functions reſpectively peculiar to them, they are to us Monuments and Vouchers of the Conformity of the Uſes and Faith. They bear both the Dates and Names of the Faithful, who made Preſents of them to Society. But the uſeful Informations they afford us, reach a great deal higher back than the Age that ſaw them firſt caſt in their Moulds. No Man can be ignorant of their having been made of a durable Matter, purpoſely to replace ancienter Monuments, which were too brittle, and decayed by Time. We, therefore, find again in them the Hiſtory and Perſuaſion of the firſt Ages of the Church, as we again find the Proofs of the Events recorded by Civil Hiſtory in the Urns and ſepulchral Inſcriptions, in Columns, Sculptures, Braſs-ſtatues, Baſſo Relievo's, Signets, Arms, and other Remains of Antiquity.

Let us, from the Uſe of theſe Inſtruments, paſs on to the Induſtry which manufactures them. How can Matters of ſo hard a Nature be maſtered, and a melted Metal be faſhioned: Let us firſt ſee the Founding of Bells: We ſhall afterwards come to the Caſting of great Figures.

BELL-FOUNDING.

This Work may be reduced to the three following Articles. 1. The Proportions of a Bell. 2. The Fabric of the Mould. 3. The Melting of the Metal.

I. *The* Proportions.

The ſimple Proportions.

The Bell-founders diſtinguiſh two Sorts of Proportions, *viz.* the ſimple, and the relative. The ſimple Proportions are thoſe which ought to be between the ſeveral Parts of a Bell, and which Experience has ſhewed to be neceſſary towards rendering it ſweetly ſonorous. The relative Proportions are thoſe which eſtabliſh a relative Relation between one Bell and another, ſo that their combined Sounds may effect a certain determined Harmony.

The relative Proportions.

The ſeveral parts of a Bell.

The Parts of a Bell are, 1. The Sounding Bow, or the inferior Circle which terminates it, growing thinner and thinner: The Brim, which is alſo called in *French, la Panſe* (the *Paunch* or *Belly*) ſome call it alſo, *la Pince,* (the *Pinch*) It is the Part of the Bell on which the Clapper is to ſtrike, and which is kept thicker than the reſt on this Account. 3. The Third's-place, *viz.* the outward Sinking of the Middle of the Bell, or rather the Point under which it grows wider and wider to the Brim. 4. The Waiſt or Furniture, *viz.* The Part of the Bell which grows always wider and thicker, by a Supply of Metal which is larger and larger quite to the Brim. 5. The Upper-vaſe, or that half of the Bell which riſes above the Waiſt. 6. The Pallet or Crown, which is the Cover of the Bell, and ſupports the Staple of the Clapper within. 7. The Crown, which are Branches of Metal uniting with the Canons, bent, and hollowed through, to receive the iron Keys, by means of which the Bell is hung up to the Beam which is at once its Support and Counterpoiſe when it is rung out.

The Founder begins by taking the Thickneſs of the Brim of the Bell to be caſt, or the Thickneſs of the Brim of the largeſt Bell, when he is to make many agree together with different Notes. This Brim is the fundamental Rule of the whole Work. To meaſure the ſaid Thickneſs, he uſes Compaſſes with bent Legs, and carries this Meaſure upon a Rule, divided into Feet, nches, and Lines. Such is, for Inſtance, the Meaſure

ſure N A (Plate 27, Fig. 1,) The Brim GE is the ſame Meaſure as NA, which is divided into three Thirds. Each Third is called a Body, in *French*, *Corps*. They give a Body of Thickneſs, that is one Third of NA, or one Third of the Brim to the Crown IHR. They likewiſe give a Body or Third of the Brim to the Cannons L, which is a Cap or Addition, wherewith to ſtrengthen the Crown as far as H. This Cap ſerves in large Bells to give more Solidity to the Rings than the Thickneſs of only one Body would do. The Cap does not reach as far as R, and does not cover the whole Crown by one Body and an half round. This Part may be ſtrengthened according to other Proportions, which I ſhall preſently mention to you. The Thickneſs of the Bell from the Crown HR to the Waiſt FD is uniform, and but one Body: And then it grows bigger and bigger quite to the Brim GE. The Sound-bow GEA is a Triangle, whoſe Baſis GA is the Diagonal of the Square, which the Side GE multiplied by itſelf, or by its Equal EA, would form. All theſe Lines, quite to the Brim GE, are Portions of a Circle, the Center of which is found by fixing the Diameter and Height of the Bell.

Vanoccio, in his *Pyrotechnia*, written in the Beginning of the ſixteenth Century, has ſpoken very confuſedly of theſe Meaſures. A hundred Years after him, Father *Merſenne* *, who was a better Geometer, and a better Harmoniſt than him, has left us a ſurer Method, and more rational Proportions. The Diameter of the Crown ought to be, according to him, ſeven Brims and an half; that of the inferior Opening fifteen Brims; and there ought to be twelve at the Height from A quite to R, where the Crown begins. In order to have the ſeveral Degrees of Thickneſs and Curvature, you muſt, upon the Line of Altitude AR, divided into twelve Brims, draw two perpendicular Lines, *viz.* GE, at the Diſtance of one Brim, and FD at the Height of ſix. GE, being taken upon the Meaſure EA, ſhall be the greateſt Thickneſs appointed to receive the Blows of the Clapper. FD ſhall be the Waiſt. In order to have the Point D, you muſt take the Length of one Brim and an half upon the

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* Harmon. Univ. Vol. II. Book VII.

Perpendicular drawn as far as 6, which is the Middle of the Line RA. The Founder, having now ſome fixed Point, will eaſily find the Centers of the Curves which form the Pendants of the Bell. He opens his Compaſſes of the Meaſure of thirty Brims or Parts AN, and, fixing one of the Legs upon R, he draws with the other a Portion of a Circle without. Then, fixing his Compaſſes in D, and drawing another Arch that cuts the foregoing, the Point of Interſection is the Center of the Curvature RD. Then he draws the Center nearer, by the Diſtance of one Body or Third of the Brim, drawing, as before, two Arches from the Points H and F, and from the Interſection draws the inward Curve HF. From F and G his Compaſſes, opened to twelve Brims, will likewiſe procure him the Curve FG; and the ſame, being opened only to ſeven Brims, will, from the Points D and E, give him the Curve DE to form the Furniture.

Theſe ſimple Meaſures, which would perhaps be ſtill kept ſecret by the Founders, and give over to all the Innovations they might be pleaſed to make in them, had they not been publiſhed by Father *Merſenne*, are, as well as the Form of the Bell, of very ancient Invention. It will not be improper here to inquire into the Reaſon of this Structure; the Form itſelf of the Bell being one of the greateſt Beauties of the Invention. The Benefit of it is not for the Eye, but for the Ear and the Purſe. If the Diameter of the Bell was the ſame every-where from Top to Bottom, the Expence would be exceſſive, and procure much leſs Harmony beſides. How! you will ſay: What Harmony can you expect from a ſingle Bell? The Sound of only one Bell is but one Sound, and a Sound by itſelf makes no Harmony: Harmony reſulting from the Concord of a Plurality of Sounds.

Reaſon and Experience taught our ancient Founders, that making their Bells all of a Shape, that is, of equal Width and Thickneſs every-where, would produce but a very dull Sound at very great Coſt. Making the Upper-part of the Vaſe ſmaller than the reſt is not enough: They have, by repeated Trials, found out the Neceſſity of diminiſhing the Thickneſs of it conſiderably. Whenever they have been laviſh of the Metal, and have made a Bell of an exceſſive Thickneſs, it produced only a confuſed Humming, like that of *George d'Amboiſe (a)*, in which thirty three thouſand Pounds Weight of Metal have been imployed, to produce a Sound, which could not be heard, if you were not informed that the Bell rings. The Founders obtained a brighter Sound, by leſſening the Expence, by the gradual ſhortening of the Diameter of the Bell upwards, and the ſucceſſive Diminution to a certain Degree in the Thickneſs of it: But they were ſtill croſſed by an Inconvenience, which led them at laſt to the Form now in Faſhion for Bells. The Bell is ſonorous in its whole Extent. The Sound of the Brim, which is the thickeſt Part of it, is of Courſe predominant; even ſo as to weaken, and ſometimes totally drown, the Sound of the Upper-vaſe. But, it often happens, that they are heard both in the ſmalleſt Bells, and more diſtinctly than in the larger. A ſingle Bell may then produce an Harmony, and the Combination of the two Sounds will be pleaſant or diſagreeable, according to the Proportion of the upper with the inferior Diameter. If the Upper-vaſe is exactly ſubduplicate, or half of the inferior, that is, ſeven Brims and an half to fifteen; this will be the Ratio of two to one, of the Whole to one Half. And as the String of a Baſe-viol gives the *Ut* Grave, whilſt its Half give the *Ut* Sharp, the Diameter of the Upper-vaſe being in the Proportion of one to two, or of the Half to the Whole, whilſt the Brim gives the *Ut* Grave, the Upper-vaſe will ſound the ſharp Octave, which is an agreeable Concord, and is heard in almoſt all Bells without being remarked, becauſe the two Notes of a juſt Octave reſemble much the Uniſon. But, when the Upper vaſe is ſomewhat more or leſs wide, it may make us hear, together with the Sound of the Brim, an Interval of a Seventh or a Ninth, or any other Interval. That Seventh makes a Diſcord; and the Ninth, which is not a fine Conſonance, may be diminiſhed, and make a falſe Octave with the predominant Tone of the ſecond Bell. But, here is a ſtill greater Cacophony.

The ſharp Octave is not only moſt commonly heard in Conjunction with the Sound of the Brims, but there are

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(a) A Bell, famous for its large Size, in the South Tower of the Cathedral of Roan in Normandy.

Bells in which, beſides the foregoing Sounds, you moreover hear the Sound of the Third's-Place, or of that Part which grows wider and wider below the Waiſt ; according to the Bent given to this Part, it will prove more or leſs ſunk and thick. Here is that which will, in my Opinion, reſult from the Variety of the Thickneſſes, which is a neceſſary Conſequence of the Variety of Methods followed by Founders in their Proportions. When you put a few Drops of Water in a Glaſs, and with the Tip of your Finger, dipt in that Water, rub the Brink of the Glaſs circularly, the whole Vaſe begins to reſound, and changes its Tone, in Proportion as you put more or leſs Water into it. The Liquor being but one Body with the Glaſs as it were, the Sound of it becomes grave in Proportion as the Quantity of Matter increaſes ; and it becomes ſharper as you diminiſh the Quantity of the Liquor. The Third's-Place of the Bell may then add to the predominant Sound of the Brim, and to its ſharp Octave, produced by the Upper-vaſe, a third or a fourth, or any other Conſonance, good or bad, according to the Nature of the Bent, which admits more or leſs Metal, as it ſwells or flattens theſe Parts more or leſs. This third Sound is not difficult to be diſtinguiſhed in the two fine Bells of St *Germain des Prez*. Our ſkilfulleſt Founders, and learnedeſt Harmoniſts, unanimouſly agree, that they have heard nothing more perfect in this Kind than the Concord of five of theſe mingled Sounds in the two large Bells of the Cathedral of *Rheims*, and of three very diſtinct ones in the biggeſt of the two, which is four and twenty thouſand Pounds Weight, according to the Inſcription. When this laſt is rung alone, it ſtrikes with equal Clearneſs the two Octaves along with a third Tone, which makes a Fourth with the Grave, and the inverted Fifth with the ſharp Octave. When both Bells ring in Company, the two grave Sounds, which are very argentine and mellow, are always accompanied with two Fourths of the utmoſt Brightneſs and Truth. They are not heard a whit leſs diſtinctly than the two loweſt Tones. From theſe four Sounds, always ſurmounted with the upper Octave of the ſharpeſt Bell, there reſults an Harmony which affects thoſe who have no Skill in point of

Muſic, although they think they hear but two Sounds inſtead of five.

But the Combination of theſe different Sounds, which is the Effect of the ingenious Structure of the Bell, and which muſt needs pleaſe when juſt, may become falſe, and even render an excellent Piece of Metal very diſagreeable, when the Founder does not direct the Proportions of his Bell well, or when, having a Bell to reſtore in a concordant Chime, he happens to follow, in the new Caſting of it, Proportions different from the Caſting of the others. An irregular Sound, going in Company with that of the Brims, proves diſcordant, and makes a falſe Harmony, although you think you hear but one Sound: The Ear is offended by it without knowing why. If theſe Sounds, already ill ſorted in one ſingle Bell, come to be mixt with thoſe of another, the Diſcordance is greater ſtill. A Founder, who would exactly determine all the Effects, which muſt needs reſult from ſuch or ſuch ſimple Proportions, ought to have a Theory much ſuperior to that of a country Bell-founder, who has no other Guide but his old Method and traditional Rules.

The relative Proportions of Bells.

A no leſs Diſorder is reigning in the relative Proportions that fix the Concordance of ſeveral Bells. The Workmen govern themſelves in this Work upon the campanary Scale; concerning the Uſe of which, it would be perfectly needleſs to make them ſpeak. They make a great Myſtery of that Scale; but Father *Merſenne* has long ago rendered it public. This learned Monk has demonſtrated it to be defective, contrary to the Rules of Harmony, and ſubject to Miſtakes that may ruin them to all Intents and Purpoſes, by the Neceſſity of caſting a-new, at their own Coſt, a large Ring of concordant Bells. Nor are they ſurer of any thing now than they formerly were. It is plain, that, inſtead of taking the Advice of ſome learned Guide, they obſtinately keep to the Rubrics of their Fathers, ſince they hardly ever give us any Concords in which they muſt not be allowed the Third or Quarter of a Note. But informing the Public of Solemnities in ſuch doleful Tones as have been produced in ſome late Caſting of Bells, is a ſtrange

Abuſe of its Indulgence. If we heard no other Sounds of Bells but thoſe of the largeſt Bells of St. *Germain des Prez*, we might be tempted to attribute a ſure Knowledge and infallible Principles to our Bell-founders. But, what ſlight Opinion muſt we have of their Talents, when we hear the tireſome Train of the four or five Semitones, which are dolefully lamented in the Ring of St. *Germain l'Auxerrois?* Thoſe who hear them, as they go by the Church, are at firſt diſpleaſed with it, and ſoon fall a laughing at the pitiful Chime, or ſecretly curſe the Bell-founder. But the learned Ears of the Neighbourhood might poſſibly take Pity of the poor Artiſan, and be moved to render the Succeſs of his Work infallible, by improving his Practice by a more judicious Theory.

Let us, till ſome learned Geometer comes to treat in a compleat, though at the ſame Time, practical Manner, this Operation, which is of Concern to both the Town and Country; let us, I ſay, make uſe of the Corrections which Father *Merſenne* has made in the Practice of Bell-founders. They run upon the Rule of the ſeveral Thickneſſes of the Bell, called in *French*, *Brochette des épaiſſeurs*, and the Rule of the Diameters, called likewiſe in *French*, *Brochette des Diametres*.

The Brochette des epaiſſeurs.

The Rule of the Thickneſſes, or *Brochette des épaiſſeurs*, is a Stick of what Length you pleaſe, which we have made one Half-foot long, with four Faces or Sides, repreſented by the unfolding ADFB *Fig.* 1. *Plate* 28.

To direct all the Meaſures of a Bell, you muſt fix the Diameter of them. The Diameter is proportioned to the Thickneſs of the Brim, and the Thickneſs to the required Weight of the Bell. We ſhall, therefore, begin by the Rule of the Thickneſs or Brim. Experience has taught us, that, in order to employ with Succeſs five and twenty Pounds of Metal in the making of a Bell, it may be made of the Thickneſs of ſeven Lines marked KA in the Face A: But it may be made leſs; and this firſt Thickneſs of the ſmalleſt Bell will rule all the following; as the whole Octave may be ruled by the Thickneſs of the biggeſt Bell. The firſt Thickneſs in the Face D anſwers to the Weight 30 $\frac{46}{135}$, and will ſerve for the ſecond Bell. The firſt Thickneſs in the

Face anſwers to the Weight $43\frac{1}{5}$, and is for the third Bell The firſt Thickneſs in the Face B anſwers to the Weight $59\frac{7}{27}$, and will ſerve for the fourth Bell, which, by this means, will be but one third thicker than the ſmalleſt KA. For the fifth Bell, you muſt come again to the firſt Face of the *Brochetic*, or Stick A, and there, going upwards, take the ſecond Thickneſs, which anſwers to the Weight $84\frac{3}{4}$, and which is by one half more conſiderable than KA. The ſame Order muſt be followed for the next Bells, and, if they are above eight in Number, you begin again by the third Thickneſs of the Face A of the *Brochette*. You make a Rule of Three in order to find out the Thickneſs ſuitable to the intended Weight, proportionably to any Weight of the *Brochetic*, and the Thickneſs correſponding to it.

Suppoſing that the Meaſure KA gives the Brim of a Bell of twenty Pounds. The Brim of the Bell next to it muſt be thicker of an eighth Part to make a Tone major below it: And, if it makes the Tone minor, the Brim muſt be larger of a ninth Part, becauſe the Ratio of the firſt Tone is as nine to eight, and that of the ſecond, as ten to nine. If you have a Mind to make a third Bell, being the third Major below, the Brim of this muſt be a quarter thicker than that of the firſt Bell. The fourth Bell, making the fourth below, ſhall have its Brim thicker by one third Part. The fifth Bell, making the fifth, ſhall have its Brim one half thicker. If any firſt Bell is two Lines thick, the fifth ſhall be three; and ſo of the others, according to the Ratio's of each Tone or Interval from one Bell to the other: But, if you have a Mind to know the Weights, you muſt treble the Ratio of the Tones, which rule the Brims or Thickneſſes. For Inſtance, to know the Weight of the ſecond Bell, when it makes the Tone major with the firſt, you muſt treble the Ratio of nine to eight, that is, cube both nine and eight. Nine by nine makes 81, which Product multiplied by nine makes 729. Eight multiplied by itſelf makes 64, which being again multiplied by eight makes 512, the Cube of eight. The Weight of the ſecond Bell muſt, in the Tone major, be to the Weight of the firſt, as 729 is to 512. Wherefore you muſt find a Number being to 25, the Weight of the ſmalleſt Bell, as 729 to 512. If then 512 gives 729, how much will 25 give? The Rule of three will give 35 and a ſmall Fraction. But in the Caſe of the Tone minor, cubing the Numbers nine and ten, the Proportion will give the Weight 30 and a ſmall Fraction, as is ſeen in the firſt Thickneſs of the Face D of the *Brochette*. Suppoſe you have a mind to know the Weight of the Bell that ſhall make the lower Octave of the ſmalleſt Bell that weighs 25 Pounds? The String of an Inſtrument, when it is the double of another String, gives the lower Octave of it: And the half of any String is the acute Octave of the whole one. Likewiſe, the double Diameter and the double Thickneſs will give the lower Octave of the Bell of 25 Pounds. But, what can be the Weight of the double or lower Octave? It cannot be fifty. The Ratio of the Weight which extends on all Parts, and over the whole Height, muſt be trebled, by cubing the Numbers 1 and 2, which are the Exponents of the Ratio of the Octave. The Number 1 multiplied by 1 gives 1, and the Cube of one is one, 2 multiplied by 2 gives 4, which Product multiplied, the Root gives eight the Cube of two. As one, the Cube of one, is to eight the Cube of two, ſo is 25 Pounds (the Weight of the ſmalleſt Bell) to the Weight of the Octave looked for. Now, Unity is eight times in eight; therefore 25 muſt be eight times in the Number deſired. This Number is 200 exactly, that is the Weight of the eighth Bell, or of the fourth Bell of the ſecond Rank, marked on the Face B of the *Brochette*. Theſe Examples may ſuffice, if not to perform the Work, at leaſt to ſhew how it is performed.

The falſe campanary Scale, or *Bâton de Jacob* of the Bell-founders, which you will find here attending Father *Merſenne*'s Scale, and which is repreſented unfolded with its eight Faces; gives Thickneſſes, which are falſe with regard to the Weight. Of this you may judge by the Aſteriſk *. It is the Octave of XXV, and it ought to have only twice the Thickneſs of XXV, marked in the fourth Face. But it proves to have more, and is falſe of courſe. However, the Bell-founders take upon this *Bâton de Jacob* the Thickneſs relative to the Weight of any deſired Bell, and reciprocally find upon it the Weight relative to any given Thickneſs, by fixing their Compaſſes upon the *Arabian* Figure on one Side, and upon the *Roman* Figure on the other. The Weights, which they fancy to be ſuitable to thoſe Thickneſſes, are marked here from a Bell of XVIII thouſand Weight to one of only ſeven Pounds.

Having thus conſidered the *Brochette* of the Thickneſſes and Weights, let us now conſider that of the Diameters, or the Diapaſon which rules the egiht Bells of an Octave, by the Proportions of the Diameters.

The Brochette of the Diameters

When you have the Brim of the largeſt Bell, you quickly find the Diameter of it, and the Meaſures of the other ſeven. But, inſtead of giving here the *Brochette* of one Concord, where the largeſt Bell is five or ſix Feet wide within at Bottom; let us be contented with a *Brochette* of one half Foot only, as the Line AB, *Fig.* 2. *Plate* 28, whereon to take the Meaſures of the eight Bells of a Ring: We ſhall divide it into ten equal Parts, and ſuppoſing the whole *Brochette*, or its ten Parts, to be the Diameter of the largeſt Bell, we ſhall take nine of them for the ſecond. The eight Parts remaining will be for the third Bell. If AB is the Meaſure of the Diameter of the largeſt, the ſecond ſhall have CB for its Meaſure, and the third, being meaſured by DB, will make the third major with the firſt. Next to this you muſt divide AB into four equal Parts, and ſubſtract one: The other three will make exactly the Semi-tone required, and give the true Diameter of the fourth Bell EB. This is the common Concord. If you will have a fifth Bell FB, you muſt divide AB into three Parts, and ſubſtract its third Part AF. The other two Thirds FB are the Diameter required. You will have the ſixth Bell GB by dividing CB into three Parts, two of which muſt be taken. You will have the ſeventh, by dividing BF into five Parts, the fifth whereof being ſubtracted, the Remainder BH is the Diameter required. Finally, you will have the eighth Bell, or the Tone of the Octave, by dividing AB into two equal Parts. BI, the ſubduplicate or half of BA, will make the acute Octave. The harmonic Numbers of the eight Notes have been put by the Sides of theſe Spaces, to certify their Exactneſs: But, the Line AB***, whoſe Diviſions are the Rule of Bell-founders, is in a great many Points beyond or behind the right and requiſite Interval.

In order to apply theſe Meaſures to the required Concord, the Founder takes a very plain Compaſs (it is the Ruler AB marked *Fig.* 1. *Plate* 29) divided into Feet, Inches, and Lines, from the Notch A. He introduces the Edge or Brim of the Bell propoſed as a Model, or Rule, into the ſaid Notch, which becomes the Center, as it were, of a ſlight Motion given the other Extremity of the Rule B. The ſame Motion is repeated two or even three Times over, in order to be certain, by an invariable Mark of the Place where the Brim of the Bell is the fartheſt upon the Ruler. This Meaſure being taken, the Founder has his whole Concord of Bells, by applying it to the ſame Proceſs and Meaſures we have juſt ſpecified for a Diameter of ſix Inches.

The Practice of Father *Merſenne* is ſtill followed, for the Proportion of the Thickneſſes and Weights, by the Workmen who have taken Notice of it: But the Form of the Bell has been altered a little near a hundred Years ſince he has been dead; and, on many Occaſions, Bell-founders have had very good Succeſs, in following the Method which has been communicated to me by a Man of Merit, who joins to the deepeſt Knowledge of Sounds ſingular Skill in point of Mechanics (a).

This Method conſiſts likewiſe in the Diviſion of the Brim by means of the *Brochette*, and in the *Echantillon*, which is the Dimenſion of the Size and Thickneſs of the Bell.

The Brochette, or Diviſion of the Brim. Plat. 27. Fig. 3.

1. The *Brochette* is a wooden Ruler, upon which the Workman marks the principal Diviſions of the Brim, becauſe it is the Meaſure he is to go by in the ſettling the Thickneſs and Mould of the Bell. This *Brochette* is eaſy to be made. Having determined, by the Proportion of ſuch or ſuch Thickneſs with ſuch or ſuch Weight, the exact Meaſure of the Brim of a Bell to be new-caſt, or of the largeſt Bell of a complete Concord; the Workman carries the Thick-

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(a) Mr. Cochu, Organ-Builder, and Organiſt of the Cathedral of Chalons upon Marne.

neſs taken upon his Ruler, which is repreſented here by a B, in *Fig.* 3. *Plate* 27. It extends from the Figure o, to the Line marked 1 *Brim.* Then he cuts this Brim into two at the Line marked $\frac{1}{2}$, then into three thirds, by the two Lines marked $\frac{1}{3}$ and $\frac{2}{3}$: Next to this he divides one third into five, to have the fifteenth Part of the Brim, marked here $\frac{1}{15}$: The laſt Mark is of one Brim and a half.

Plat. 27. Fig. 2.

2. To delineate the *Echantillon* CD, otherwiſe called the Caliber or Profile of a Bell, that will ſerve to rule the Proportions of the Mould; draw firſt a diagonal indefinite Line as AD; then open your Compaſſes one Brim, which you ſhall take upon the *Brochette*; of this Opening of the Compaſſes, mark on the Line AD twelve equal Parts, which will conſtitute the Height of twelve Brims from the Point o to the Point A; then draw perpendicularly, or at right Angles upon this Diagonal, five other indefinite Lines in the following Manner. The firſt muſt be drawn at the Diſtance of one Brim and a half, reckoning from the Figure o; the ſecond is to be drawn at the third Brim; the third at the fifth Brim and a half; the fourth at the eleventh Brim, and the fifth at the twelfth Brim, except one ſixth Part. The firſt, third, and fifth will ſerve you to make your *Echantillon*, or Model, and the other two will ſhew you if you have proceeded exactly in this Work. Open your Compaſſes one half third or ſixth Part of a Brim: Carry that Opening from the Point A, which is the Extremity of the twelfth Brim, to the Point P, which is determined upon the Diagonal AD by the ſaid Opening, and from P to the Points K and L, which are alſo determined by the ſame Opening of the Compaſſes. Carry the ſame Meaſure from o to D, which will make the Edge of the Bell. Take next upon your *Brochette* one Brim and a half, and carry it from o to G. Carry the ſame Opening from five Brims and a half to the Point H, to make the outward Concavity of your Bell: And from the Point H to I carry the exact Meaſure of one third and one fifteenth Part of a Brim for the Swelling of the Bell.

Open your Compaſſes one Brim and a fifteenth Part: Set one of the Legs upon the Point G, and with the other Leg make the Arch RR, and then make the other Arch QQ, by ſetting the Leg of the Compaſſes on the Point I, where the firſt Brim terminates. Without changing this Opening of the Compaſſes, fix one of the Legs upon the Point of Interſection F, and make the rounded Brim SGi. Draw a right Line from F to D, which done, there remains nothing to be done but the drawing of the large curve Strokes.

Open your Compaſſes twelve Brims; put one of the Legs upon H, and draw an Arch without your Model. Then fix your Compaſſes upon F, and make another Arch cutting the former; and from the Point of Interſection, as from a Center, draw the Arch HF. Then open your Compaſſes ſeven Brims and a half; ſet one of the Legs upon I, and then upon G: Having made two other Arches, you muſt draw from the Point of Interſection of the Arch IG: This makes the Furniture or Swelling of the Bell quite to the Brim.

To have the Upper-barrel of the Bell. Open your Compaſſes thirty-two Brims; then from the Points L and H draw two Arches cutting one another, and from the Point of Interſection, as a Center, draw the Curve LH. You will draw the Curve KI in the ſame Manner, keeping to the ſame Opening of thirty-two Brims. You have now the lower Part, the Thickneſs, and the whole Contour of the Bell both within and without.

To make the Cap of the Bell, you muſt open the Compaſſes one half Brim, fix one of the Legs upon the Point o, and upon the other Leg draw the ſmall Arch E upon the Line FD. Then, having opened your Compaſſes eight Brims, you muſt ſet one of the Legs upon E, and with the other Leg draw a ſmall Arch within the Model. Do the ſame from the Point P, and from the Interſection * you muſt draw the Stroke PM. In order to fix the Thickneſs of the Cap, you muſt give it one third and one fifteenth of a Brim, and draw the Arch NT, which will begin the Bottom of the Bell, and a Parallel to the Arch MP. Then you will divide this firſt Thickneſs of the Cap into two equal Parts, and make two Arches paralell to the two foregoing, *viz.* the Arch LL between, and in the exact Middle of them, and the Arch Aa above.

All theſe Operations being performed, take the exact Meaſure of one Brim and a half, carry it from K to k, and from V to v. Then look out for Centers at Diſcretion, to draw the ſmall Arches &&, &&. This will give you the Concavity of the Bottom N. In order to round the Top of the Barrel, take one third of a Brim with Compaſſes, mark from V the Points c and b: Open the Compaſſes from c to b: Fix one of the Legs upon c, and draw a ſmall Arch within the Model: Do the ſame from b; then from the Interſection, as a Center, turn your Compaſſes to make the inward Roundings. Let the Diſtance between the Points T and a, which croſs the Arches that make the Cap and the upper Barrel, be your ſecond Opening of the Compaſſes for the outward Rounding. From the ſaid Points T and a, draw two Arches within the Bell, and then from their Interſection round off the outward Sharpneſs of this Part. Obſerve, however, that the prick'd Lines are of no Service.

The Diapaſon, or campanary Scale of an Octave.

Giving a true and beautiful Proportion to a Bell, in order to render it ſonorous, is not doing all. Moſt commonly it accompanies other Bells, and it is often allowed not to have the fineſt of Sounds, provided it makes the requiſite Concord with the reſt. Now, this Union and good Underſtanding, which makes up for a great many Faults, proceeds from the Skill of the Founder, in the careful Regulations of the relative Proportions. He is directed in this Work by the campanary Scale, which is alſo called Diapaſon and *Brochette* of the Octave, becauſe the Proportions to be obſerved among a Ring of eight Bells are marked upon it.

The Line ABBC repreſents the whole Diameter of the biggeſt Bell, which I have folded here into two Halves, lying by the Side of one another for want of Space. (*Fig.* 3. *Plat.* 28.) the two Ends AC are then the two Extremities of the Diameter of the grave Tone *ut*. BC, which is half of it, is conſequently the acute Octave *ut*; and you muſt always add the Length BC to all the other Meaſures marked upon the half AB, to have the Diameters of the eight Bells, from the biggeſt AC, to the ſmalleſt BC incluſive. Put AB, BC in one ſingle

Line: Divide AC into four equal Parts: Fix one Leg of the Compaſſes, upon one of theſe fourth Parts, upon A, directing the other Leg towards B; the Point it will fall upon is the Tone *fa*. Divide the Space *fa* C into ſeven: Fix the Point of the Compaſſes upon A, without altering the Opening, which is one ſeventh Part of *fa* C, and directing the other Leg towards B, you will fall upon the Tone *ré:* Then, without changing the Opening, fix your Compaſſes upon *fa*, and the ſame Opening, carried twice towards B, will give you the ſeventh, which is the Tone *ſi*. Divide AC into three; fix the Compaſſes upon A, diminiſhing the Opening one third, and the two thirds remaining will be the Tone *ſol*, or the fifth. Divide *fa* C into eight, and the Compaſſes open one of theſe eighths, and directed from *ré* towards B, will give you the Tone *mi*. Divide *fa* C into eleven: Fix the Compaſſes upon *ſol*, and the Opening of the eleventh Part of *fa* C will give you the Tone *la*, remaining to be found.

As the next Operation muſt be the regulating of the ſimple and abſolute Proportions of the Caliber of each Bell, upon the Thickneſs of its reſpective Brim; you will find theſe Thickneſſes, as well as the Diameters, of the whole Octave, 1. By multiplying the Thickneſs AD of the biggeſt, by its Diameter AC, which produces a Parallelogram; 2. by erecting to the ſeven other Tones, and in the Parallelogram, ſeven Perpendiculars; 3. by drawing from C to D a Diagonal, which, by biſſecting the Perpendicular upon the acute Octave *ut*, will give it the exact Half of the Thickneſs of the *ut* grave, and diminiſh the Thickneſſes of the other Bells in a Proportion relative to the Intervals of their Tones. See *Fig*. 4. *Plat*. 28.

Reckoning the Diameter of the biggeſt Bell to be of 180 equal Parts, the Diviſions of Father *Merſenne* will produce the eight Tones,

ut, ré, mi, fa, ſol, la, ſi, ut,

According to the eight Numbers following.

180, 262, 144, 135, 120, 108, 96, 90.

The ſecond Method will, by the Retrenchments marked, produce the Octave

ut, ré, mi, fa, ſol, la, ſi, ut,

According to the following Numbers.

183, 161, 144, 135, 120, 108, 97, 90.

The learned Organiſt, not truſting to his own Theory any more than to the Practice of others, has himſelf directed and performed the caſting of a Concord of eight large Bells, according to the laſt Method, and the whole proved exact and true. But he might have tried his Rules upon much larger Bells, and I think I ſhall act agreeable to both his Modeſty and your Intereſt, in forewarning you that theſe Speculations may be carried to a much higher Degree of Exactneſs and Certainty. My chief and conſtant Intention is to avoid prepoſſeſſing you in favour of a Method, that might occaſion any Diſſatisfaction to you in the Practice. I only aim here at ſhewing you, with ſome Degree of Exactneſs, how the ſeveral Enterpriſes of Society are governed and carried on.

II. *The Structure of the Mould of the Bell.*

The Matters neceſſary for the making of the Mould are,

I. The Earth. The moſt binding is always the beſt. The chief Caution to be uſed, as to this Earth, conſiſts in ſifting it well, to take away the minuteſt Stones, or any thing that might occaſion Chinks and Unevenneſſes upon the Surfaces of the Mould.

II. The Brick-ſtone. It is uſed only for the inner Mould or Core, and for the Furnace.

III. The Horſe-dung, Hair and Hemp, mixt together with the Earth, to prevent all Crevices, and render the Cement of a ſtronger and more binding Nature.

IV. The Wax. A Matter whereof the Inſcriptions, Coats of Arms, and other Figures are made.

V. The Tallow. It is mixt by equal Portion with the Wax, the whole being rendered as yielding as a ſoft Paſte by Fire, in order to put a ſlight Lay of it upon the Shell, or outer Mould, before any Letters are applied to it: The Reaſon of this Practice will be given by and by.

VI. The Coals. They only ſerve to bake and dry up the Mould.

Neceſſary Tools for the Conſtruction of the Mould.

The Scaffold, which conſiſts of four Boards ranged upon a couple of *Treſtles*, as high as a Man's Waiſt. They carry upon this the Earth groſly diluted, to mix it with Horſe-dung, beating the Whole with the following Tool.

The Beetle or Spatula three Feet long, or more, rounded at one End in Form of a Handle, which ſerves to hold it, C *Fig.* 2. *Plat.* 29. and ſix or ſeven Inches wide at the other End. The Sides AA are thinner at the Brim than in the Middle B, and form two Edges to beat the Mortar ſoundly, in order to mix the Hair and Horſe-dung throughout, and beat the whole well together.

The Compaſſes of Conſtruction is the chief Inſtrument for the making of the Möuld: It conſiſts of two Legs very different from each other, and joined by means of a third Piece. The *Fig.* 3. repreſents theſe Pieces ſeparate.

The firſt Branch is a Board of a Height proportioned to the Bell, whereon the Founder delineates the Profile of the Mould he is to conſtruct. The *Fig.* 3. repreſents but one of thoſe Curves: You may ſee all the three Pieces in *Fig.* 4. which repreſents the Compaſſes mounted.

The ſecond Branch is an Iron-peg, ending in Form of a Pivot towards D: The upper Part of it turns into a Hole made in a Piece of Timber laid acroſs the Bit where the Mould is built. See *Fig.* 4.

The third Piece of the Compaſſes, or Piece of Aſſemblage, is an Iron-bar, made of a conſiderable Thickneſs, on purpoſe to cut a long Groove, or rather a long Mortiſe through it about A. The Extremity of it B is terminated by a long Needle or Tenon, to be introduced into an Aperture of the ſecond Branch bored through it at B. This Tenon is likewiſe bored through at c, to admit a flat Pin which ſerves to faſten the Piece of Aſſemblage ſtrongly to the ſecond Branch. The additional Support C alſo contribute much to the Solidity of the Aſſemblage.

The Groove or Mortiſe A of this Piece of Aſſemblage is appointed to receive the Board, or Branch of the Compaſſes. They let that Board ſlide into the Mortiſe, where it is faſtened with very thin Wedges of the whole Breadth of the Board. The chief Attention here conſiſts in faſtening the Board, ſo as to give it the Obliquity it ought to have to form both the upper and inferior Diameter of the Bell. See. *Fig.* 4.

The Founder's Shelves. Theſe are Boards of ſolid Wood, where are the Ingravings of the Letters, Cartridges, Coats of Arms, Seal of the Founder, Images of Saints, *&c.* All theſe Ingravings muſt not be above half a Line deep at the moſt.

PRACTICE.

THEY begin by digging a Hole (marked AAAA *Fig.* 4.) of a ſufficient Depth to be able to contain the Mould of the Bell, together with the *Ear* or *Common* under Ground, and ſix Inches lower than the Terraplain of the Place when the Work is done. The Extent of the Hole muſt be wide enough to yield a free Paſſage between the Mould and the Walls of the Hole: or between one Mould and another, when there are ſeveral Bells to be caſt in one and the ſame Hole.

They erect, at the Center of the Hole, a Stake BB *Fig.* 4., driving and faſtening it ſtrongly in the ſolid Ground. This ſerves to ſupport an Iron Peg (EE *Fig.* 3. & DD *Fig.* 4.) on which the Pivot of the ſecond Branch of the Compaſſes turns. See EE *Fig.* 4.

They next ſurround the ſaid Stake with a ſolid Brick-work perfectly round, five or ſix Inches high, and of a Diameter equal to that of the Bell. The Founders call this Part of the Work, which ſerves as a Baſis to all the reſt, the Mill-ſtone. See CC *Fig.* 4.

The Parts of the Mould are the Core, the Thickneſs of which is marked (*Fig.* 4.) betwixt the pricked Line 4. 4. and the Line 3. 3. This ſame Thickneſs has not been repreſented on the other Side of the Figure, to avoid any Confuſion with the pricked Line of the Board of the Profiles.

The ſecond Part of the Mould is the Model of the Bell, or rather the Bell itſelf repreſented with its Thickneſſes, between the Lines 2, 2. & 3. 3. *Fig.* 4.

The Shell, which is the third Part of the Mould, is repreſented by the Thickneſs incloſed between the Lines 1. 1. & 2. 2. of the ſame *Fig.* 4. They delineate upon the firſt Branch, or the Board of the Compaſſes, theſe three Curve Lines, 1. 1, 2, 3, 3. and, before the Compaſſes are mounted by the Aſſemblage of the ſeveral Pieces thereto belonging, they cut off with a Hatchet and Chiſel all the Wood of the Board, according to the Direction of the Line 3. 3, in order to have the Curve, which is to ſhape the outward Surface of the Core, that is, the inner Form of the Bell. Then they mount the Compaſſes, introducing firſt the Upper-part of the Iron-pin into a Hole in the Croſs-Beam A A: They place the Pivot exactly in the Center of the Iron-piece D D fix'd upon the Stake B: Then, they introduce and fix with Wedges the Board of the Curves into the Groove or Mortiſe A of the Piece of Aſſemblage H, the Tenon of which they introduce into the Aperture I of the Iron-peg, faſtening the whole with the flat Pin L. *Fig.* 4.

All being thus diſpoſed, and the Board of Curves cut, ſloped and hollowed according to the Curve, 3. 3. *Fig.* 4, that is, according to the Curve, which is to ſhape the outer Surface of the Core, or firſt Part of the Mould, they begin to raiſe the ſaid Core.

This is made of Bricks, of which they break the Corners without, to give the Maſonry the exact Rotundity it is to have. The Bricks are laid in Courſes of equal Height, upon a Lay of Mortar of plain Earth, and they take care to make the Whole of bound Maſonry from one Courſe to another, as is generally done in all Maſon's Works, avoiding the direct Meeting of two Mounters or perpendicular Joints, in two Courſes laid one upon the other.

At the laying of each Brick, they bring near it the Branch of the Compaſſes on which the Curve of the Core is delineated, in order to place that Brink, ſo as that there may remain between it and the Curve the Diſtances of a Line or more, that ſhall afterwards be filled up with ſeveral Layers of Cement.

When the Core is raiſed to the Height of the Stake B *Fig.* 4, they take care to fix upon the Maſonry the Iron-piece DD *Fig.* 4; and they continue the Work up to the Height 3. 3. *the ſame Fig.* leaving an opening 3. 3. for the introducing of the Coals wherewith the Core is to be baked.

They cover this Maſonry with a Layer of Cement made with Earth mixt with Horſe-dung, and, in order to make it of an even Smoothneſs every-where, they begin to move the Compaſſes of Conſtruction in the following Manner. A Man leaning upon the Board puſhes it forward, turning twice or thrice round the Core. The Curve, which is cut Bezil-wiſe, rubbing upon the Maſonry, carries off the whole ſuperfluous Part of the Cement, leaving only what it cannot take away. The Overplus is collected by another Workman, who receives it in his Hands, and ſpreads it again over the Places on which the Board is going to paſs.

This firſt Lay being finiſhed, they directly put the Fire to the Core, by filling it half with Coals through the Opening 3. 3. *Fig.* 4. which they keep carefully ſhut up during the baking, with a Cake of Earth baked ſeparately.

Here it is proper to obſerve to you the right Uſe of the Stake BB *Fig.* 4. One might, it ſeems, do without this Piece, by making the Iron-peg EE long enough to place its Pivot upon the Mill-ſtone CC. But, by ſo doing, the whole inferior Part of the Iron-peg would have reddened in the Fire put round it. The leaſt Motion wou'd of courſe have made it to bend in this very great Length, and rendered it of no Uſe. This is remedied by the Stake BB, which ſerves as a Support to the Iron-piece DD, which they make the Compaſſes play and turn upon. When they begin to raiſe the Core, the Compaſſes and the Iron-piece DD have no other Support but the Stake: But the Maſonry, once raiſed up to D D, becomes in its turn the Support of the piece DD, the Extremities of which are taken in and faſtened within the Thickneſs of the Core. The firſt Fire conſumes the Stake, whereby the Iron-piece DD is charged with the whole Weight of the Compaſſes.

The firſt Fire is left in the Core, a half, and ſometimes a whole Day together when the Mould is large. When they ſee that the firſt Lay is thoroughly dry, they immediately cover it with a ſecond, then with a third, and with a fourth if need requires it; every one of theſe Lays being always perfected and ſmoothed by the Board of the Compaſſes. But, they never paſs from one Layer on to another, before they have put the Fire again into the Core to dry up that which has been juſt finiſhed. The Core is judged to be in its Perfection, when the Board or Profile turning over it carries the freſh Cement intirely off, without leaving any upon the laſt dry Layer: They end this Part of the Work, with laying tempered Aſhes and ſmoothing them over the Whole, by the circular Motion of the Compaſſes. The Aſhes ſerve to fill up the minuteſt Cracks and Chinks, to prevent the Introduction of any melted Metal during the Caſting.

The Core being finiſhed, they take the Compaſſes to pieces, in order to cut off from the Board the whole Thickneſs contained between the Lines 2. 3. & 2. 3, that is, the Thickneſs of the Model, or, if you will, the Thickneſs of the future Bell; ſo that the Board thus cut out along the Curve 2. 2, repreſents the outward Form of the Bell. An Edge of Metal is fix'd on the whole Extent of this Curve, and the Compaſſes are immediately put in their Place again, to begin the Model, or the ſecond Piece of Mould.

It conſiſts of a Mixture of Earth and Hair, which is applied with the Hand on the Core in ſeveral Pieces or Cakes, which unite and coaleſe, by being ſpread ever ſo little: This coarſe Work is perfected by ſeveral Layers of a much thinner Cement of the ſame Matter. Each Layer is flattened and ſmoothed by the Compaſſes, and dried by the Fire before another is begun. The laſt Layer of the Model is a Mixture of Wax and Tallow ſlightly ſpread over the Whole. This ſerves to facilitate the Separation of the Model from the Shell which we are going to ſpeak of.

After this Lay of Wax and Tallow, there remains nothing for the Perfection of the Model, but the applying of the Inſcriptions, Coats of Arms, *&c.* for which Work they keep upon a Chafing-diſh a ſmall Veſſel full of melted Wax, into which they dip a Pencil, wherewith they ſlightly beſmear the Place where the Letter is to be applied: The ſame Operation is required for every individual Letter.

Before the Shell or outer Mould is begun, they take the Compaſſes to Pieces, to give the Board a new Shape, by cutting off all the Wood between the Lines 1, 2, 1, 2, that is, all the Wood which fills up the Place of the Thickneſs to be given to the Shell.

The firſt Layer of the Shell is very different from the others, both for its Matter and the Manner of applying it. They, indeed, take for this the ſame Earth as for the reſt; but it muſt be ſifted very fine. Whilſt it is tempered in Water, they mix it at ſeveral Times with a ſlight Lay of Cow's Hair untangled well, and thoroughly cleaned. The Whole is brought to a Kind of thin Cullis, which they pour gently upon the whole Model, not to diſcompoſe the Inſcriptions or Figures in *Relievo* applied to it. This Matter, on Account of the Fluid it is mixed with, ſpreads of its own Accord all over the Model, covers the *Relievo's* and fills exactly all the minute Sinuoſities and Cavities of the Figures, Letters, *&c.* This Operation is repeated till the Whole is two Lines thick over the Model. They let this Layer dry, which, in twelve or fifteen Hours Time, will, of its own Accord, and without Fire, become a Cruſt, which they cover with a ſecond Layer of Cement of the ſame Matter, but not ſo thin as the firſt. When this ſecond Lay has got ſome Conſiſtence by drying, they put the Compaſſes again, and light a Fire in the Core, taking Care not to give it more Activity than is neceſſary to melt the Wax of the Inſcriptions, and gradually form in the firſt Layers the Hollows or Mould of the Letters and Figures, by the Running off of the melted Wax.

After theſe Operations, they go on with the other Layers of the Shell, by means of the Compaſſes. Here they add to the Cow's Hair of the Mortar a Quantity of Hemp, which they ſpread here and there upon the Layers, which are afterwards ſmoothed by the Board of the Compaſſes.

You are to obſerve, that the Thickneſs of the Shell comes four or five Inches lower down than the Mill-ſtone, and that it ſurrounds it quite cloſe, which ſtops all Paſſages to the Extravaſation of the melted Metal during the Caſting. The Wax precipitated at Bottom muſt be taken out before the Fuſion of the Metal.

Whatever has been ſaid hitherto of the Making of the Mould, has no Manner of Relation to the Ear or Cannon of the Bell, which requires a ſeparate Work. The Founder employs for that Purpoſe the Time neceſſary for the drying up of the Incuſtrations of Cement of the ſeveral Layers of the Mould.

The Ear of the Bell conſiſts of ſeven Rings, ſix whereof are of the Form repreſented in A, *fig.* 5. The ſeventh, which is called the Bridge, and ſerves to unite the others, is repreſented in B. Properly ſpeaking, it is only a Support perpendicularly erected to ſtrengthen the Curves: It is a ſolid Maſs, ſtronger than the ſix Rings which unite with it, and ſtill ſtronger at the Top than Bottom. It has at Top an Aperture C, deſigned to admit a Stirrup, or large Iron peg, bent at Bottom. A Branch of this is introduced into the Aperture of the Bridge, as far as the Part thereof which makes an Elbow, and then the two Branches of it are lifted up again, and put into an erect Poſition, that they may be introduced into a Couple of Holes, bored through the whole Height of the Beam, on which the two Ends of the Stirrup are faſtened with a Couple of ſtrong Iron-keys.

We may eaſily frame to ourſelves a true Idea of the Situation of the Rings in the Aſſemblage. The Bridge B. is placed in the Center of the Cap or Summit of the Bell; but ſo, as that the Aperture, through which the Stirrup is introduced, may face the Part of the Belfrey which the Beam of the Bell is to reſt upon. The two little prick'd Squares on both Sides of the Aperture mark the Place where the lateral Rings are united to the Bridge,

Bridge. One Ring lies on one Side of the Opening, and another on the other Side, with a Diſtance of much the ſame Thickneſs between the two, to make room for the Stirrup: So that the Bell is ſupported with a Couple of Rings on each Side of the Belfrey, the two foremoſt Rings are placed upon the two other Faces of the Bridge 3 and 3, and make a right Angle with the other toward the Place of their Re-union with the Bridge.

The making of the Rings begins by that of the Models, that is, by Maſſes of beaten Earth, which aſſume under the Hand the Form and Bigneſs to be given to the Rings and Bridge. When theſe Pieces are finiſhed, they are baked in the Fire, in order to have the Hollow of them, which is procured after the following Manner. They take the Model of the Ring A, *fig.* 5, and lay it on the Side and in the Poſture repreſented in the Figure, upon a Lay of Cement of Earth and Cow-hair, which is of a Softneſs that will yield to the leaſt Motion of the Workman. They gently preſs the Ring into this Earth one Half of its Depth, and leave it there as long as is neceſſary to harden the Earth about it, and then take it out without breaking the Mould: The ſame Operation is repeated twelve times, in order to have twelve half Moulds of the ſame Kind, which being united, two and two, may make the Hollows of the ſix Rings of the Cannon. They do the ſame to have the Hollow or Mould of the Bridge, and they bake all theſe pieces in the Fire to put them together.

You may ſee, from *fig.* 4, that, in the Conſtruction of the Mould, the upper Part of it has hitherto remained imperfect and open, that one might introduce into it the Coals neceſſary to bake the Maſonry and the Layers of Earth. However, it is upon this empty open Part, which leaves the three principal Pieces of the Mould ſcanty, that the Rings which conſtitute the Ear of the Bell muſt be placed. The Thing is done after the following Manner: They begin by putting in this Hollow the Iron-ring which is to ſupport the Clapper: Then they make a Cake of Clay perfectly round, of a Diameter fit to fill up the Diſtance 3, 3. and 4. 4, *fig.* 4, and of the Thickneſs 3. 4, that is, of the Thickneſs of the Core. This Cake being baked in the Fire, they clap it upon the

Opening 3. 3, where it is ſoldered with a thin fluid Mortar, ſpread over the whole Circumference of it, which binds this Cover cloſely to the Core when it comes to be dry.

The Hollow of the Model, *viz.* the Diſtance 2. 2. and 3. 3 is filled up in a plainer Manner. They do it only with an Earth ſufficiently moiſt to fix on the Place. They fling it at ſeveral Times upon the Cover of the Core 3, 3. They make it compact by beating it gently with a Peſtle or flat Stone, and they continue this Operation till the Maſs of Earth is of the Height 2. 2. *Fig.* 4. This done, the Workman, with a wooden Trowel, dipped in Water, ſmooths the Earth at Top, to bring it level to 2. 2.

It is upon this Cover or Layer from 2 to 3, which is to be taken off afterwards, that they aſſemble the Hollows of the Rings, putting firſt the Hollow of the Bridge in the Center, and then the others in the Order hereafter mentioned. When every Thing is in its proper Place, they ſtrengthen the Outſides of the Hollows by loading them with Mortar, in order to bind them at Top with the Bridge, and keep them ſteady at Bottom, by means of a Cake of the ſame Cement, which fills up the whole Aperture of the Shell, from 1. 1. to 2. 2. *Fig.* 4. They let the Whole dry, that ſo it may be removed without any Danger of breaking. This puts the finiſhing Stroke to the Mould. Now Room muſt be made for the Metal which the Bell is to conſiſt of. This Room is actually filled up by the Model or the ſecond Part of the Mould 2. 3. The Buſineſs is at preſent to diſlodge it.

They begin, by pulling off by main Force the Cap, that is, the Hollows of the Rings, which, by their Union with the Bridge and the Cake that fills the whole Vacuity 1. 1. 2. 2. *Fig.* 4. form a Totality which muſt afterwards be ſtrongly baked. You ſee under the Cake the Hollows or Apertures of the Bridge and Rings, which the Metal is to go through before it enters into the Vacuity of the Mould. You may ſee theſe Apertures in *Fig.* 6, which repreſents the under Part of the Aſſemblage or Cap. A. the Bridge BB. a Couple of Rings placed on one Side, and the other on the other Side of the Swinging of the Bell, above the Place where the Clapper ſtrikes, CC, CC, four Rings, placed two and two on each Side, in the Direction of the Croſs-beam which the Bell hangs upon.

The Shell or outer Mould being unloaded of its Ear or Rings, they range under the Mill-ſtone, at CC *Fig*. 4. five or ſix Pieces of Wood about two Feet long, and thick enough to reach as far as the lower Part of the Shell all but a few Lines. Theſe Pieces being thus placed at equal Diſtances round the Mill-ſtone, they thruſt between them and the Mould wooden Wedges, which they drive with a Mallet, to ſhake the Shell off the Model it reſts upon, and ſeparate it therefrom, ſo as that it may with main Force, or by means of Engines be pulled up, and got out of the Pit.

When the Shell is removed, and the Wax taken away, they break the Model in Pieces, which are thrown as uſeleſs: Nor do they forget breaking and removing the Layer of Earth 2. 2. 3. 3, becauſe it is through that Vacuity that the Metal muſt run from the Hollow of the Rings between the Shell and the Core. They beſmoak the whole Inſide of the Shell, which is now out of the Pit, by burning Straw under it; which contributes to the Smoothneſs of the Surface of the Bell, by the Exactneſs with which this Black fills the minuteſt Cavities of it. This done, they put the Shell in its former Situation, by means of correſponding Marks which they previouſly made at the Bottom of it; ſo that it fills exactly the ſame Place, and leaves the ſame Interval between it and the Core, before the Cap is again put on over the Shell. They add the Vents (*See* A *Fig*. 5.) over the Rings; the prick'd Lines over the Ring A repreſent a Vent or hollow Pipe, through which the Air goes out of the Mould as the Metal runs into it. There is a like Vent over the Ring, ſuppoſed to be on the other Side B of the Bridge or central Ring. Theſe two Vents are united to the Rings, and with each other; by a Maſs of baked Cement, the upper Part of which riſes ſeveral Inches out of the Earth, to facilitate the giving Vent to the Air.

Then they put all this heavy Maſs of the Cap, the Rings, and the Vents over the Shell, and ſolder it there with a Lay of thin fluid Cement, which they bake gradually by covering it ſoon after with burning Coals;

which done, they fill up the Pit, ſqueezing and beating ſtrongly the Earth round the Mould as the Pit is filled in.

III. *The* CASTING.

THE Furnace conſiſts of two Parts, one of which is for the Fire, the other for the Metal.

The Fire-place is a Kind of Chimney marked B *Fig.* 7, the lower Part of which is in the Ground, and ſerves to receive the Aſhes in D. It is ſeparated from the upper Part by a Grate C, deſigned to ſupport the Wood, which they introduce into the upper Part of this Place through the Aperture A, which is always kept cloſe ſhut with an Iron-plate.

The Part of the Furnace deſigned to contain the Metal is a Vault marked E, F, G, the Bottom of which, GG, is made of an Earth ſqueezed and rendered compact with a Rammer: All the reſt of the Furnace is built with Brick. This Part of the Furnace has four Apertures; the firſt at E, through which the Flame in the Chimney ſpreads over the Metal with its whole Activity. The ſecond Aperture at G, which remains ſhut up with a Flood-gate or Stopper of baked Earth or Iron, which is never opened but after the Metal is melted, to which it opens a paſſage into a Canal, terminated by a Gullet or Funnel, which communicates with the Top of the Mould. The other two Apertures of the Furnace, one of which is at H, and the other on the oppoſite Side, ſerve to cleanſe and purify the Metal, as it melts, and to take away the Droſs, by means of wooden Boards two Feet long, fixed at the End of long Poles or Handles, like ſo many Rakes. The Furnace does alſo emit, through theſe two Apertures, the thick Smoak which might cool and fix Part of the Metal.

The Ground or Hearth of the Furnace muſt be ſloping, and have a Bias from E to G towards the Flood-gate, and from this to the Gullet H. They alſo take Care that the lower Part of the Aperture E ſhould be above the Ground of the Furnace, and at a ſufficient Height, to hinder the Metal in Fuſion from overflowing into the Chimney, through the Aperture E.

We have but one Word more to ſay of the Choice and Quantity of the Metal.

The red Copper is undeniably the beſt. The Yellow, though of an inferior Quality on Account of the Calamine, may however do. But no other Kind of Copper ought to be employed here, as Mixtures of this Kind would render the Metal too brittle, and the Sound too dull.

Tin of the fineſt Sort, added to the Copper in a Proportion of five and twenty in a Hundred, that is, of one Part to three of fine Copper, makes a perfect Mixture. They never put the Tin into the Furnace but when the melted Copper is purified of its Droſs, and a little before the Caſting.

The Quantity of Metal to be put into the Furnace is regulated by the Bigneſs of the Bells; but Prudence requires that there ſhould be rather more than leſs. The Reaſon of this is obvious: There is a Waſte of three Pounds in a hundred in the Fire, and it is proper to prevent the Diſorders that may be occaſioned by accidental Decays.

The Weight of the Clapper.

When the Bell, hooked on its Beam by the Rings, is ſuſpended over the Belfrey, ſo as to ſwing on it with no great Friction, and armed with ſingle, double, or quadruple Levers, according to its Maſs, and the Neceſſity of facilitating the Swing; they tie the Iron-clapper on the Ring within, with a Piece of Leather of a proportionable Strength, which is fixed or untied, by means of a ſtrong Buckle; ſome are for making the Clapper a ſmall Matter leſs than five and twenty Pounds for a Bell of five hundred: Somewhat leſs than fifty Pounds for a Bell of a thouſand, and a little more than five hundred for one of twenty thouſand Weight. Theſe Rules are not well ſettled yet. Circumſtances occaſion Varieties, and oblige Workmen to act with a prudent Diverſity, till they arrive at producing a Sound ſufficiently diſtinct, without running the Riſk of cracking the Bell by too violent a Percuſſion.

The Motion of the Clapper.

As we look at the Inſide of a Bell when they are raiſing it, we are apt to think that, at every Swing the Clapper muſt needs fall again upon the inferior Brim of the Bell, becauſe it makes a Fold with the Ring it hangs on, and plays freely within the Bell. But, the Motion of Impulſion being gradually communicated to the whole Body of the Clapper by the Ring within, the former ſtiffens at laſt by the centrifugal Force which every Body put in Motion will always acquire, as is experienced by the Maſs of a ſwinging Cenſer, or a Sling. Thus the Clapper draws a Portion of Circle along with the Bell, and remains nearly at an equal Diſtance from both Brims. But, as the Bell is raiſed, it experiences a Reſiſtance greater and greater in the going up. Its Vibration ſlackens and ſtops at laſt. The Motion of the Ring within being likewiſe ſlackened and ſtopp'd, it ceaſes for an Inſtant imprinting any Action on the Body of the Clapper. The latter, which experiences a Gravitation much leſs than that of the Bell, and turns freely upon the Ring, continues its Vibration when the Bell has done ſwinging. The Clapper muſt then reach the upper Brim, juſt as the Water, which you carry in a Veſſel, acquires at firſt the ſame Quickneſs of Motion as the Veſſel. If you ſlacken, or entirely ſtop the Motion of the Veſſel, the Liquor ſtill follows its firſt Direction, and runs over the Brim. The Clapper might crack the Bell if it did ſtrike it when it falls down again. This Effect might be the Reſult of the Oppoſition of the two Motions; but, the Inſtant the Bell comes down, the Ring within does the ſame, and draws a new Curve. It then hurries the Clapper away with it, and takes it off the Brim of the Bell.

It is not only by its bright Sound that the Bell is of Service to the Public; it bears beſides an Inſcription and a Name which become Monuments fit to illuſtrate Families; for, Acts of Bounty are the true Acts of Nobleneſs.

The People are moreover acquainted with the Things that are true Matters of Jubilation to them, by Chimes of Bells of three or four Octaves, with which it is cuſtomary in ſome Countries to adorn the Steeple of the Cathedral or the Belfrey of the Town houſe. The

Sound of each Bell is ſuddenly extinguiſhed or prolonged at Pleaſure, according as the Muſician thinks proper to lower or retain the Piece of Cloth which attends the Striking of the Clapper. Learned Men, very well verſed in the Science of Harmony and the Tuning of Inſtruments, have ſometimes conceived Schemes of a Combination of Inſtruments fit to procure to the People a greater Share than they can well take in the Beauties of Muſic, which is generally either too weak to reach their Ears, or too much flouriſhed to be reliſhed by them. The Wiſh of theſe Lovers of the Art was, that one might re-unite a Number of large Bells and a Set of organiſed Trumpets, that ſhould begin their Muſic at once by the Motion of one and the ſame Set of Keys; becauſe nothing is more agreeable to the People than the Jingling of percuſſive Muſic, nor more ſuitable to large and ſpacious Places than the bright Sounds of Trumpets and Reed-Inſtruments, nor fitter, in ſhort, to correct the Dryneſs of Sounds produced by Percuſſion, and of but an inſtantaneous Duration, than the Fulneſs of Sounds which may be continued without any Diminution of Strength.

The Caſting of great Guns and Bomb-Mortars is little different from that of Bells. Formerly a Core made the Cavity of the Gun. An earthen Model, that was dried without, and then broken to Pieces, was the Rule of the Quantity of Metal to be intoduced in its Stead. The outward Form of it was determined by the Hollow of the Shell. But, now-a-days they are contented with uſing only that Shell, and they render Guns leſs ſubject to burſt, by running them maſſy and without Core. They bore them with a Steel-trepan, which is ſet a-going and worked by four Horſes. But, I catch myſelf here talking War to you, at the Sequel of the Arts deſigned to give Inſtruction.

An Examination of certain Effects aſcribed to the Sound of Bells.

They have often attributed to the Sound of Bells certain Effects, the Diſcuſſing of which may be of ſome Uſe, either to free Men from Errors, or to indulge a reaſonable Curioſity. The Sound of Bells is ſuppoſed to have the Virtue of diſſipating Storms, and diverting Thunder-bolts. The Queſtion is worth examining into; either to ſpare us the Trouble of ringing Bells when it thunders, if it is to no Purpoſe, or to introduce that Cuſtom among thoſe who overlook it, if it may be any how beneficial.

Harmoniſts pretend, on the other Hand, that whatever produces a Noiſe by being ſtruck, always proves to have the Relation of either an Uniſon, or an Octave, or a Fifth, or of any other muſical Interval, with a ringing Bell, or with the String of an Inſtrument touched ſo as to give it a Vibration. I think this Opinion of theirs may be decided even by the Ear itſelf. But what may be diſputed, is the Uſe they have ſometimes made of the ſaid general Diſpoſition of ſounding Bodies, to account for certain obſcure or extraordinary Effects, ſuch as that Phænomenon which excited the Curioſity of ſo many Virtuoſi, whom the Ceremony of the King's Coronation had drawn to *Rheins* in the Year 1722. There are but few People that have not heard of the wonderful Correſpondence which happens between one of the twelve Bells of the Abbey of St. *Nicaiſe* of that City, and the firſt of the five Southern Arches or Buttreſſes. The Wonder, if there is any, is, that, when the fifth Bell above the largeſt is rung, the firſt of the Pillars that ſupport the Arch, though eighteen Feet diſtant from the Tower, and almoſt forty Feet lower than the Bell, and without having the leaſt Appearance of Relation to it, begins to move as ſoon as the Bell begins to ring. You ſee it go backwards and forwards like the Bell, and ceaſe moving the Inſtant the Ring ceaſes. If the eleven other Bells are rung without this, the Pillar ſeems to be informed of it: It remains obſtinately at Reſt, and gives not the leaſt Sign of Life. But, if the favourite Bell goes along with the reſt, the Pillar diſtinguiſhes it in the Croud, and falls o' dancing with a Faithfulneſs which our Virtuoſi would fain know the Reaſon of.

Let us firſt begin with the Influence of Bells over Thunder: We ſhall try afterwards to clear the other Phænomenon, which has indeed ſomething very ſingular in it.

Let

Of the Power of Bells over Thunder.

Let us not loſe our Time any more than our Logic in proving that Sounds when carried afar off, and the Motion of the Air agitated by the Ringing out of one or ſeveral Bells, are Cauſes very fit, according to ſome, to diſſipate Storms, or even fitter, according to others, to pierce the Clouds, and determine the Fall of the Fire ſuſpended in the Skies upon the Church where Bells are ringing. Experience may turn the Scale here, and inſtruct us better. I have, within theſe thirty Years, been Witneſs of five Storms in which the Thunder-bolt fell upon five different Steeples where all the Bells were ringing out. Very credible People have told me of twenty more Caſes perfectly like thoſe. The Compariſon of the Churches where it is cuſtomary to ring at the Approach of Storms, with theſe where this Practice is overlooked, is intirely in Favour of thoſe who keep their Bells ſilent during the Thunders; and, if it is not a ſufficient Authority for us to dare to aſſert that the Sound or Percuſſion of the Air fixes a Road to the celeſtial Fire as yet indeterminate, we may at leaſt very reaſonably think, after ſo many Inſtances, that the Sound of Bells has no Kind of Efficacy againſt the aerial Fire. The horrid Noiſe of Thunder is a ſufficient Warning to the Faithful to pray to God: And why ſhould we be at a great Charge to prolong a Noiſe that can be of no Service to us?

As to the peculiar Queſtion of the Relation which has for about a hundred Years been perceived between one of the Buttreſſes of the Church of St. *Nicaiſe* and a certain Bell; the Obſervers have had Recourſe to Sympathies, Magnetiſms, Electricities, and Attractions, For, what is it Philoſophers will not lay hold of in their Doubts? The Opinions which prevailed at that Time were two: One was, that the Bell, being ſtruck by the Clapper right againſt the Pillar, though ſomewhat lower than the Bell, a Maſs of Air ſprung from it, that ſtruck directly againſt the Maſs of the ſupporting Pillar. The other Sentiment was, that there being an Uniſon between the Parts of the Bell and the intimate Parts of the Stones of that Pillar; the Correſpondence manifeſted itſelf at the Time when the Bell was rung, as the String of an Inſtrument vibrates when it is the Octave of another String touched with the Finger.

About the Beginning of this Century, the Abbé *de Louvois*, at the earneſt Requeſt of certain Naturaliſts, cauſed the large Apertures, which are in the Eaſtern Wall of the Steeple, between the Belfrey and the Pillar, to be ſtopp'd partly with ſtrong woollen Blankets and partly with oiled Cloth. Now, is the Courſe of Air ſtopp'd, or, at leaſt the ſtrongeſt Impulſion diverted from the Pillar: And, yet it trembled as before the Minute the Sound of the Bell could be heard. The Harmoniſts thought themſelves ſure of a compleat Victory; but a Ringer ſnatched it from their Hands, by unbuckling the Clapper of the Bell. For, both when he made it ſwing alone in that ſilent Condition or in Company with the others ringing out, the very ſame Effect was ſtill produced. The Claſhing of the Air when ſtruck, and the ſympathetic Tremblings of the Uniſon cannot then be aſſign'd as the Cauſe.

If we would arrive at the Knowledge of the true Cauſe of this Effect, there is a Neceſſity of ſetting forth the Matter of Fact in a clearer Manner than it has heretofore been, and of illuſtrating it by its chief Particulars. Here then is the Deſcription of the Figure of the Building, without which we could not underſtand one another.

The Gate of St. *Nicaiſe*'s Church, whoſe uncommon Beauty is not what we are now taken up with, conſiſts of four large Bodies of Architecture ſomething more than fifty Feet each, and the Diſpoſal of which contributes to the Effect we would not account for. The Body of the Baſis which is more maſſy than the reſt, riſes above the Arch of the collateral Naves, and offers in Front three Portico's, the Pediments of which (ſeven in Number) and all the Ornaments are ſupported by a vaſt Number of marble Columns. The ſecond Body riſes above the Arch of the Nave a hundred Feet from the Ground floor. The third conſiſts of two Belfries of a very airy Structure, and open all through, but ſupported in common by two Stone-colonnades, which, reaching from one Steeple to the other, make, as it were, of the two but one. The fourth Body conſiſts of two large

Stone pyramids accompanied with eight ſmall ones. Each of the firſt three Bodies has two Retreats, in order to prepare from the very Ground-floor the apparent Beginnings of the Steeples and Pyramids, by leading as it were the Eye to them, not indeed by a flat ſteep Surface, but by a gradual inſenſible Diminution. Theſe four Bodies, though they conſtitute four diſtinct Orders without, yet are but one Maſs in reality. If the Motion is communicated to one Part of it, it diſperſes as much as poſſible through the Whole; and when we ſhall name the Steeple A, or the Steeple B, it muſt be taken from the Bottom of the Church to the very Croſs incluſive. The Flying out of the Arch is ſtopp'd on each Side of the Nave from the Tower to the Windows, by five Buttreſſes ninety-three Feet high, and projected a ſmall Matter more than the collateral Nave is wide. We need not here give any Attention to the round Point, nor the Pillars it reſts upon.

The Southern Steeple B and the Buttreſſes on the ſame Side have no Buildings in their Neighbourhood. The other Steeple A and the Northern Buttreſſes are ſtrengthened at Bottom by a very thick Wall, which reaches from the Steeple to the Window, and moreover by the large Square of the Cloiſter, which, by taking in all theſe Buttreſſes into its Architecture, makes the Whole more difficult to be ſhaken. The two biggeſt Bells are in the Northern Steeple A: They ſwing from Eaſt to Weſt, that is, according to a Line parallel to the Nave. The four Bells, which make a Concord with the two largeſt, are in the Southern Steeple B. The two Middle-Bells are hung up a ſmall Matter higher than the Extremity of the Buttreſs C, and they ſwing in their Steeple from South to North and from North to South. The two ſmaller Bells are thirty Feet high in the Belfrey, which is forty Feet, and they ſwing there the contrary Way of the middle Bell, that is, in a Direction parallel to the Nave, which is chiefly to be obſerved. The other ſix, which are in the Leaden-pyramid above the Nave, ſeem not to have any Share in the Motion, of which we are now inveſtigating the Cauſe: And, the four Bells in the Southern Steeple, being the chief Matter of our Inquiry, we ſhall name the two ſmaller ones 1. & 2.

And the two middle ones 3 & 4. The Bell 2. is then to be known above the reſt, becauſe it is that which makes an Impreſſion upon the firſt Buttreſs, although there is the Diſtance of eighteen Feet between it and the Tower, and the Bell be at the Height of one hundred and thirty Feet, and the Pillar ninety-three Feet only. This Diſpoſition, which is ſo little fit to eſtabliſh any Correſpondence between the Bell and the Pillar, has been the Plague of many a Naturaliſt.

But the Virtuoſi, who purpoſely go to examine the Fact upon the Spot, are a little too much taken up with the Bell and the Pillar, and not enough with certain Particulars that might be a Help towards conceiving the Communication of Motion that may be between two Bodies to Appearance perfectly unconnected. After the great Stair-caſe, which leads to an Angle contrived between the two firſt Orders of Architecture, and thence to the open Steeple where the Bells are; there is along one of the four Corners of the third Body of Architecture another little Stone Stair-caſe, all the Steps of which are in the open Air, and which leads to the Pyramid. You may ſtop and ſit down about the Middle of this ſecond Stair-caſe, whilſt the Bell 2. is rung. If you recollect yourſelf and take Notice of what you experience within you at that Time, you find yourſelf rocked from Eaſt to Weſt, and ſometimes you fancy you ſee the neighbouring Objects in Motion. The ſureſt Way is to ſhut your Eyes to avoid Diſtractions. 'Tis what the Czar *Peter* did in the Year 1717, when he came to make his Obſervations upon this Singularity. He went up the Steeple and ſat upon the ſecond Stair caſe. They fancied he was aſleep there: But it ſeems he had only ſhut his Eyes, to be able, by a conſtant Atttention, to make himſelf ſure of that Motion of the Steeple he had been forewarned of. He then dictated to his Secretary his own Thoughts concerning the Correſpondence of the Motions of the Bell with thoſe of the Pillar: And in every Place where he deſired to be led, ſuch as the Tomb of St. *Remy*, the Cathedral, or any where elſe, his Secretary always wrote whilſt he dictated to him. We may here inveſtigate the Things which were the Matter of the Reſearches of this great Genius.

The Motion of the Steeple increaſes as you aſcend. When I had got upon the Arch which is the Support of the Pyramid, I found it conſiderably more ſenſible there than upon the Staircaſe. It is not eaſy to carry the Experiment higher, becauſe the Stone-pyramid, which is hexagonal without and perfectly round within like an inverted Well, ſupporting itſelf by its own Structure, is quite hollow and free from Timber-work and Ladders, affording no actual Means of getting to the upper Apertures. But the Slaters and Plumbers, who work on the Outſides, or go to ſee in what Condition the Cement of the Joints is, or to faſten their Rope-ladder to the Foot of the Croſs for any Repairs, ſay, that they find themſelves tranſported in the Air upon a larger Space, than about the laſt Arch when the Bell *z.* is rung, and that, when the four Bells ring at once, the Line they go upon appears to them circular.

Let us now paſs on to the Northern Steeple, where the following Particulars are obſerved. The two Bells, though very large, and ſwinging in the ſame Direction as the Bell 2. imprint on the Steeple a much weaker Motion, and communicate none to the ſupporting Pillars, or none at leaſt that can be perceived. The Perplexity ſeems to increaſe as you go on: And my Aſtoniſhment was far greater one Day, when, being at the Pyramid of the Northern Steeple, where no Bell was rung, I heard ring in the other Steeple the two middle Bells 3. and 4. which hitherto had not appeared to me to have produced any ſenſible Effect. I then felt myſelf ſtrongly rocked from South to North, and from North to South. How! In the Steeple where no Bell was rung! Aye, in that very Steeple. But, in order to be ſurer of the Fact, I untied my Garter, and, faſtening it at one End to a Piece of Stone which I found over the Arch, I applied the other End of it to the inward Shelving of the Pyramid. The Stone appeared to remain motionleſs, whilſt my Hand went backward and forward with the Wall; but, ſoon after, the Stone, being ſuſpended, acquired a vibrating Motion, which made it plain that the Pyramid, the Arch, and the Northern Steeple were in a State of Vibration, although the Bells rang but in the other Steeple. This ſeems to be an Increaſe of Difficulties, and yet it is from the Concurrence of theſe Particulars that Light is to be expected. Let us, like the Geometricians, lay down a few avowed Principles, or ſome known Experiments, that may be in lieu of Principles to us.

1. A Pole, thruſt and faſtened in the Ground at one End, may be more eaſily ſhaken at Top than at Bottom, and the Motion, imprinted on the lower End of that Pole, will, perhaps, be three or four Lines wide about the Middle, and a whole Inch or more at Top. This I have experienced in the Steeple of St. *Etienne du Mont*. They were ringing one of the four Bells when I came to the Foot of the Belfrey. I perceived in the Wall of the Steeple a weak Motion, which none of the Company took Notice of. But, being come forty Feet higher, at the Gallery of the Clock, the Swingings of the Steeple became ſo ſtrong and ſenſible, that one of us laid hold of an Iron-bar to avoid Falling.

2. A very long Lever may be put in Motion as ſtrongly, and even with greater Force, by a middling Weight, as a very ſhort Lever will by a much heavier one.

3. The Motion, impreſs'd on a Body from Eaſt to Weſt, becomes leſs briſk that Way, if the ſaid Body is, at the ſame Time by another Impreſſion puſhed from South to North, and ſo on the contrary.

4. The Motion of Bodies is communicated to neighbouring Bodies. It enters, the ſtunning or reſounding Way, into the Parts that cannot be ſhaken, and by Way of diſplacing into the Parts that are free without and at Liberty to yield to the Shock.

The Truth of this Maxim is daily evidenced to our Eyes. If you lay your Hand on the Extremity of a Beam, and the other Extremity be ſtruck with a Club, the Parts of the Beam remain invariably connected in ſpight of the Shock; but, if your Hand is but negligently laid upon the Beam, it will go off at the firſt Blow. If you ſtrike with a large Hammer againſt the Window-poſt where a Sign is faſtened, the Support of the Sign, though invariable and unſhaken towards the Extremity where it is faſtened, will, however, be agitated towards the oppoſite End, and you will ſee the Sign move backwards and forwards Likewiſe, when a Coach or a heavy Cart paſſes by the Windows of your Kitchen, the Baking and Frying-pans, looſely hanging in the Air, will be agitated and reſound, whilſt the Walls, and large Pieces of Furniture, will only experience a Stunning, not very ſenſible, that will diſplace nothing. If you hang up with Strings five or ſix Ivory-globes, which remain at Reſt, touching one another in a Row, and then pull to you the firſt of theſe Globes, to let it fall on the ſecond, the latter receives the Motion, and tranſmits it to the third, without being diſplaced. The third, being likewiſe ſtopp'd by the fourth, communicates to it an Action, which the fifth will alſo tranſmit to the ſixth without ſtirring. This laſt, which plays at Liberty and without Oppoſition, is the only one that flies off the reſt, and in its coming back ſends back to the firſt one Part of the Shock it received from it. The Action is real in all theſe Globes; but the Change of Place is ſenſible only in the Extremes. This is a phyſical Caſe known even to Children when they are playing at Marbles. Let us now apply theſe Experiments to our Phænomenon.

The Application of the foregoing Principles.

According to the firſt of theſe Principles, if the Steeple can, any now and by any Cauſe whatſoever, be ſhaken but one half Line at Bottom, the Shaking will prove greater, and the Diſplacing be of ſeveral Lines or even ſome Inches in proportion as you advance higher. In like Manner, if the ſupporting Pillar C, or any other, can poſſibly be ſhaken one Line in the Point where it ſticks to the Wall of the collateral Nave H, and in thoſe where it joins to the Wall of the largeſt Nave I; the Motion muſt neceſſarily become more ſenſible as you come nearer C: Which is confirmed by our fourth Principle above, that ſupporting Pillar being diſpoſed after the Manner of Sign poſts, the out-jutting Extremity of which is connected with and joins to nothing.

From a natural Conſequence of our ſecond Principle, the two largeſt Bells of the Northern Steeple A ought to make no greater, or even a leſs Impreſſion upon a very ſhort Belfrey, than the ſmall Bells 1. and 2. upon an enormous Belfrey forty Feet high, where they ſwing at a conſiderable Height. Beſides, the Northern Belfrey is very maſſy and of very little Agility. The Southern, on the contrary, is a long Cage, always ready to play in its Mortiſes, and which, of courſe, muſt needs cauſe a much greater Agitation in the Steeple. The Belfrey of the larger Bells being but little agitated, makes but a ſmall Impreſſion on its Steeple. It may be eaſily felt in the Pyramid; but this Impreſſion is ſoon deadened at the Bottom; and is altogether unable to communicate any Shaking to its ſupporting Pillars. This could not be procured without forcing the Reſiſtance made by the collateral Wall, by that of the Cloiſter, and by another very maſſy one which has been contrived between theſe two, towards directing the Draining of Waters in a ſure Manner.

According to our third Principle the Impreſſion of the Bell 2. which, on account of its being near two thouſand Pounds Weight, muſt be conſiderably greater than that of its Companion, is occaſionally ſlackened, when it is croſſed in the Direction from Eaſt to Weſt by the Swinging of the two middle Bells 3. and 4. which is from South to North. The Timber-work no ſooner makes a progreſſive Motion Eaſtward, but that Motion is immediately broken and diverted to the North; another brings it round to the Weſt, and another to the South, which cauſes that whirling Motion which the Workmen experience, when at Work at the Top of the Pyramid. If, on the contrary, the Bells 1. and 2. are not ringing, the middle ones 3. and 4. ought, on account of the vaſt Agility of their Cage, to carry their Impulſion upon the Steeple, and make it go from South to North, and then bring it back from North to South, ſuppoſing it to be ſuſceptible of any Motion. But that Steeple makes but one Body with the other by Means of the intermediate Columnades. Therefore, the Northern one muſt ſwing from South to North and from North to South, when the Southern is puſhed that Way; in which Caſe, no Kind of Shaking will happen in the larger Nave, nor in the Wall of the collateral Nave, nor in the Pillars which ſupport them. This is then the ſenſible Cauſe of the Motion of the Northern Steeple, and of the reſt of the ſupporting Pillars or Buttreſſes, when the Bells 3. and 4. are ringing out in the Southern.

Now the Action ſo very ſingular of the Pillar C at the Ringing of the Bell 2. becomes a neceſſary Effect. Doubtleſs the Bell 1. Companion to the Bell 2. makes, on account of its Direction which is parallel to the Nave, ſome Impreſſion the ſame Way upon the Belfrey, the Steeple, and Arch of the collateral Way, and of courſe upon the ſupporting Pillar C thereto belonging of the Bell 2. It will not be long before I tell you of another Matter of Fact, which proves this Communication of the Motion of the little Bell. But, that Motion is weak, becauſe the Bell is but ſmall. The Motion of the Pillar under its Influence may be real; but, it is not received. On the contrary, the Bell 2. almoſt ſix hundred Pounds heavier than the other, and ringing at Top of a Lever forty Feet long, ought to make a more violent Impreſſion upon the Steeple according to its Direction from Weſt to Eaſt. This Motion, impreſs'd on the Steeple, is certain from the Fact, ſo as to be the moſt ſenſible of all. The Communication of it to the Arch and the collateral Wall is then neceſſary at leaſt by Way of Stunning: And, according to our fourth Principle, the Shaking cauſed by the Arch and the collateral Wall to the ſupporting Pillar, which ſtands by itſelf, and is perfectly free, that is, intirely in the Air at the Length of fifty Feet and above, muſt become ſenſible when it arrives near the Extremity C. The Whole proceeds from the Weight, the Elevation, and the Direction of the Bell 2. This Motion muſt neceſſarily be altered when it rings in Company with the Middle-bells 3. and 4. which ſwing the contrary Way: And, when the Bells 1. 3. and 4. continue ringing without the Bell 2, the Motion of the Pillar muſt ceaſe.

We have in Hand a true Touch-ſtone rightly to judge of all the foregoing Phyſics. If the ſmalleſt Bell 1, was loaded with an extraordinary Weight, having in that Caſe the ſame Weight, Elevation, and Direction as the Bell 2, it ought to produce the ſame Effect; and the Bell 2, being increaſed in Weight, ought, of courſe, to produce a more ſenſible one.

This was provided for in the Year 1707. They untied the Clappers of the four Bells of the Southern Steeple, and faſtened them invariably round the ſmaller one. A few Bottles of Wine, diſtributed among the Ringers, encouraged the Operation: And, having nothing to fear for the Bell, they ſwung it ſo briſkly that the Pillar, which had never been willing to do any Thing for it, began to dance with as much Agility as it did for the firſt. The ſecond Buttreſs did the ſame ſoon after, and its Vibrations were as ſenſible as the others.

Finally, they applied in the ſame Manner the four Clappers to the ſecond Bell. The Effect, it ſeems, muſt have proved threefold here: And ſo it did, ſince the firſt, the ſecond, and the third Buttreſſes were ſhaken at the ſame Time. A few Clappers or Bottles of Wine more would, I think, have rung the Church down.

They thought it not proper to carry Things ſo far. All was re-eſtabliſhed *in ſtatu quo*. Thoſe, who had been purpoſely poſted for Obſervation in ſeveral Places over the Arch of the great Nave, and in the ſeveral Paſſages, contrived in the maſſive Part of the ſupporting Pillars over the loweſt Nave with Glaſſes full of Water, reported that every Stroke of the Bell 2, the Water ſhivered even in the laſt Buttreſſes; that, coming nearer to the Steeple, it went backward and forward, both under the firſt Buttreſſes and over the great Arch; but, that it ſpread over the Brim at the Time of the Bell's being ſurcharged. I ſhall not then, Sir, inſiſt upon the Particulars of theſe new Experiments, any more than upon others which have been added to them. It is needleſs to heap Proofs upon Proofs, when the Mind has full Reaſons to be ſatisfied.

If you are ſo with this Explication, I muſt tell you that you are, as well as myſelf, indebted for it to the Reſearches of *Dom. John Garreau*, a religious *Benedictine* who, in the Year 1708, imparted to me all theſe Experiments and the Conſequences reſulting therefrom. This Phyſics was far more to my Liking than that of *Ariſtotle*, which was taught at that Time. We had ſome Hopes that *Dom. Garreau* would communicate his Diſcovery to the Public; but, he being dead without doing it, I have given you his Thoughts to the beſt of my Power.

He had another Notion, which is but the natural Conſequence of the foregoing, *viz.* That, in order to put a Stop to the troubleſome Viſits which this Phænomenon drew to the Abby, and an End to a Wonder, which, with the joint Help of a Guſt of Wind, may pull down the Portal one Day or other, nothing more is to be done but bringing the Bells 1. and 2. lower down, making them ſwing level with the middle ones 3. and 4. in rectangular Directions, and, above all, retrenching five and twenty Feet, or even more, from the Cage that bears them. You ſee the Reaſons of all theſe Cautions. If you ſuppreſs one half or more of the Timber-work, it will never hinder it from playing ſome ſmall Matter. It will ſtill communicate its Motion to the Steeple; but diminiſhing the Motion will however be leſſening the Danger conſiderably.

An Event has already juſtified the Wiſhes and Prophecy of this religious Monk ſince his Death. A boiſterous Wind has blown down one of the Periſtyles which unite the two Steeples. It was repaired afterwards; but the Architecture of thoſe two Columnades, and of the whole Edifice, is of a Pliantneſs which has but too often been tried; and it is on Account of its yielding obſequiouſly to any Impreſſion, that ſome unforeſeen Shock muſt bring on the Deſtruction of the Whole at laſt. About an hundred Years ago, the Eye of the Nave had already yielded to theſe Shocks, and fallen into the Church. The ſame Accident happened in the Beginning of this Age. I was then upon the Spot, and they made me take Notice that the Monument of *Maître Hugues le Bergier*, who is buried at the Entrance of the Nave, was perfectly well preſerved, whilſt all the Pavement round about had been bruiſed to Pieces. All the Maſſes of Stone, which formed the Branches of the great Glaſs-window, had diſperſed all round in both Falls, and ſeemed each Time to have gone aſide out of Reſpect to their Architect. The Preſervation of the Tomb, the Figure, and the Inſcription, is exact Truth. As to thoſe repeated Teſtimonies of Reſpect, you may, if you pleaſe, take them for Flowers; and we may be allowed to throw a few upon the Grave of this great Maſter, who is almoſt comparable to that other great Man who had, eighteen Years before, begun the magnificent Building of the Cathedral in the ſame Town (a). It is a Proof of an uncommon Share of Ingenuity in *Hugues le Berger*, to have, with Succeſs, ventured upon ſuch delicate ſlight Supports as theſe two Steeples are, ten Pyramids in Stone, the two largeſt of which are fifty Feet high, upon a Baſis of ſixteen; as it is, on the other Hand, a wiſe Circumſpection in the Architect of the Cathedral, not to have loaded his two Steeples with the infinitely greater Load of the two Pyramids which they might have been terminated by. The chief Beauty of this laſt Man's Work is not perhaps the Church-gate, on which Ornaments have been laviſhly thrown. The no leſs ſimple than majeſtic Diſpoſition of the outer Parts of this Church has far more attractive Charms for an attentive Eye; nor do I doubt but this two fold Character of the Sublime will fix yours upon the Figure I here ſend you of the other Gate: It is a perfect Model of that happy Goût which always pleaſes, and will ever proſper, in whatever Arts it ſhall be diſtinguiſhable.

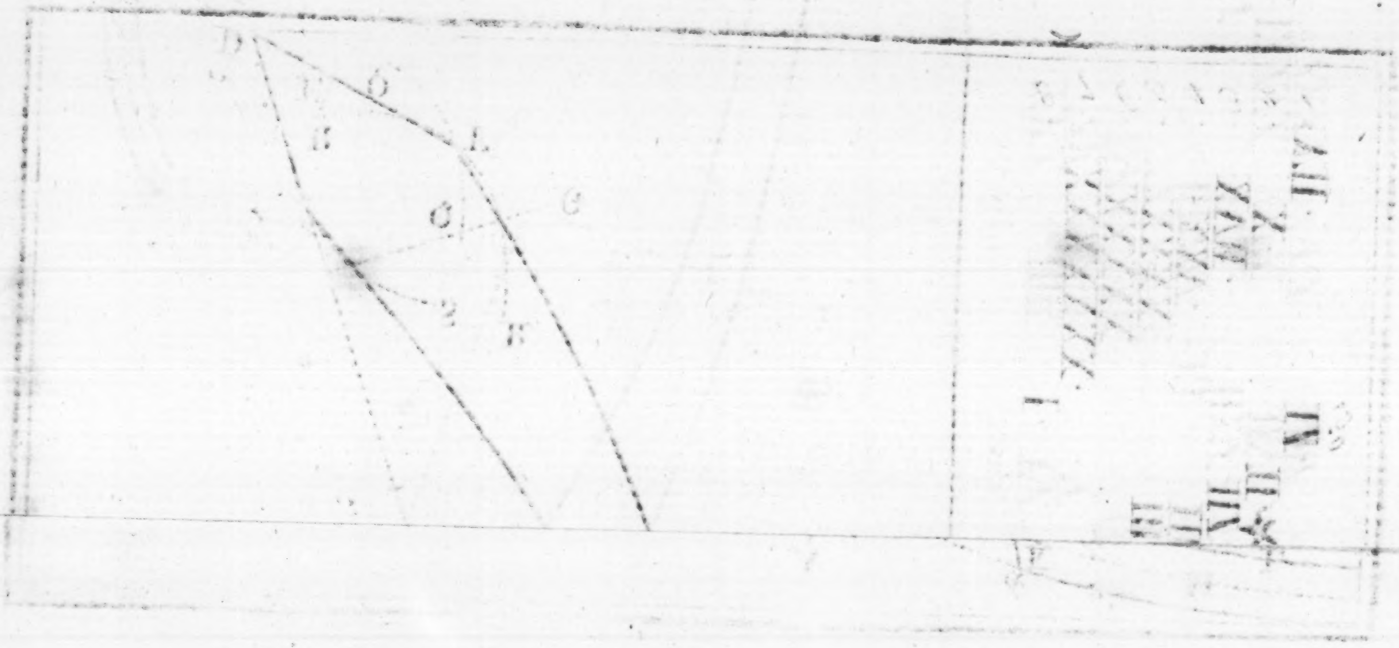
The Contours of the Figure of *Hugues le Berger*, and the Inſcription, which have ſubſiſted for theſe five hundred Years, are Strokes deeply ingraved in the Stone, and filled up with melted Lead. This Way of Inſtructing Poſterity coſts little, laſts long, and facilitates the Inſpection of Monuments by the Diverſity of the Colours of Stone and Lead. Doubtleſs, one might employ Lead and Pewter to make ſolid Monuments, and of a large Size: But their very Pliantneſs, which allows us to imprint on them any Figure at Pleaſure, even without melting them, is what renders the Preſervation of them more difficult: And of all Metals none will more faithfully preſerve the Outlines of what it repreſents than Caſt-braſs *.

PLATE

(a) The Cathedral was begun in the Year 1211, and St. Nicaiſe in 1229. The Architect was buried there 1263. Martlot Hiſt. Rom.

* I have juſt heard that the Timber-work of the Southern Steeple of St. Nicaiſe had been repaired a few Years ago, and unluckily at the ſame Height; that the Bells ſwung in it as they did in the former Cage, which ſtill produced the ſame, though weaker Effects. They

ſay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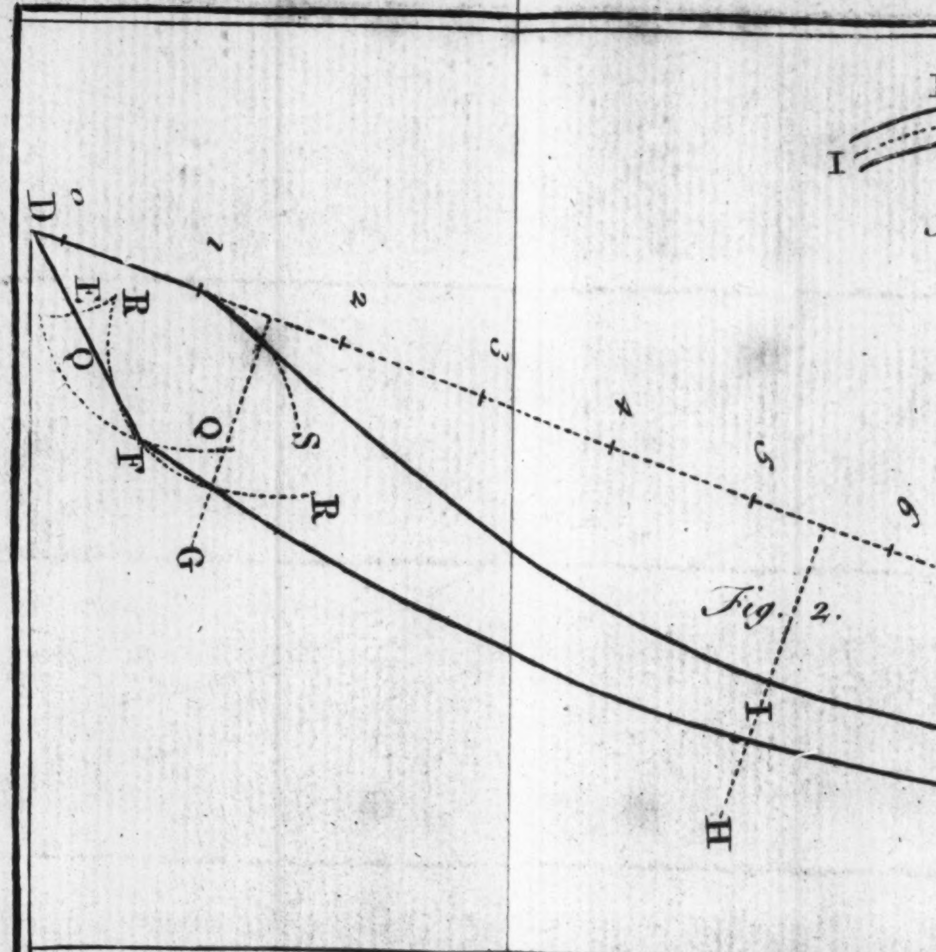


Fig. 2.

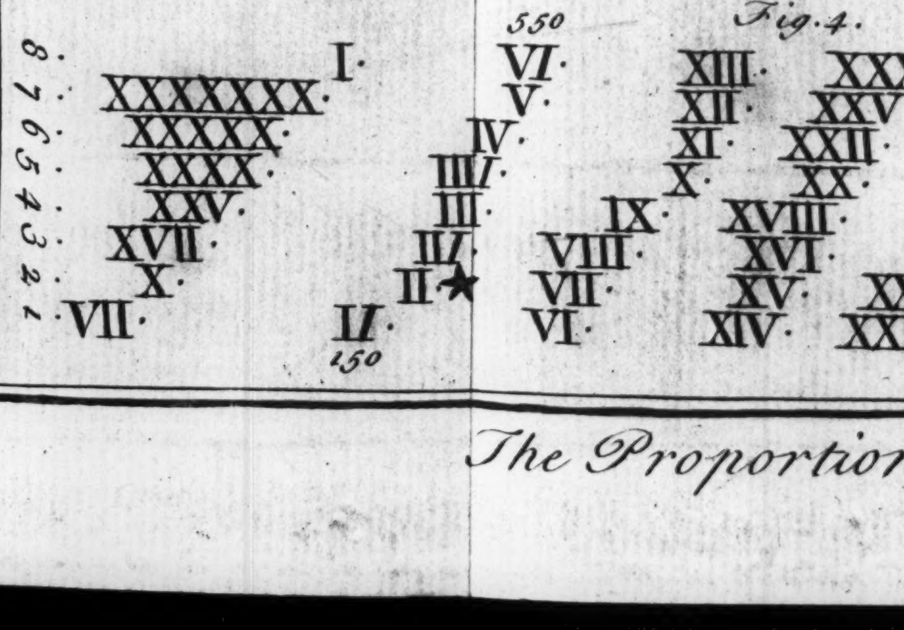
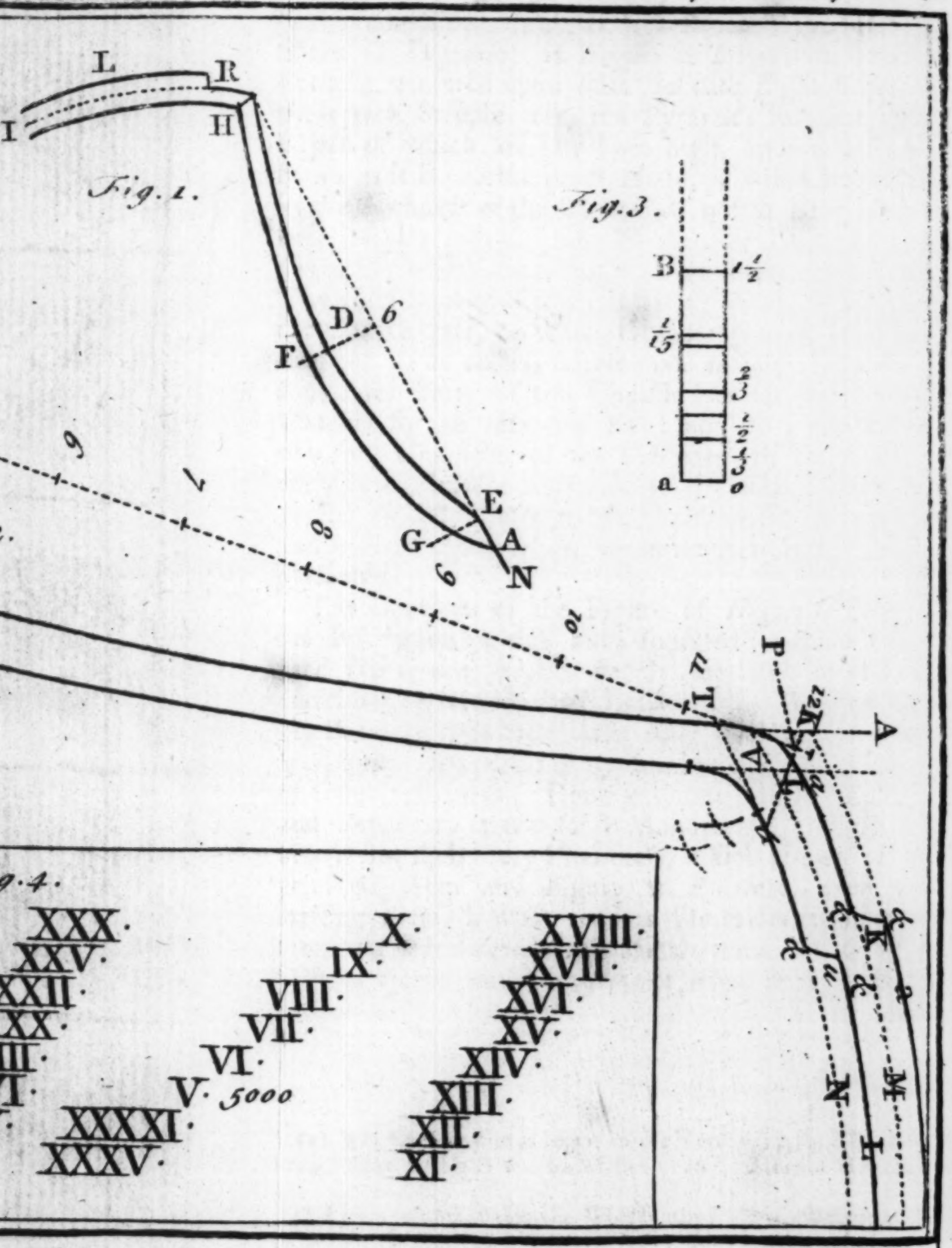


Fig. 4.

The Proportion



rtion of a Bell.

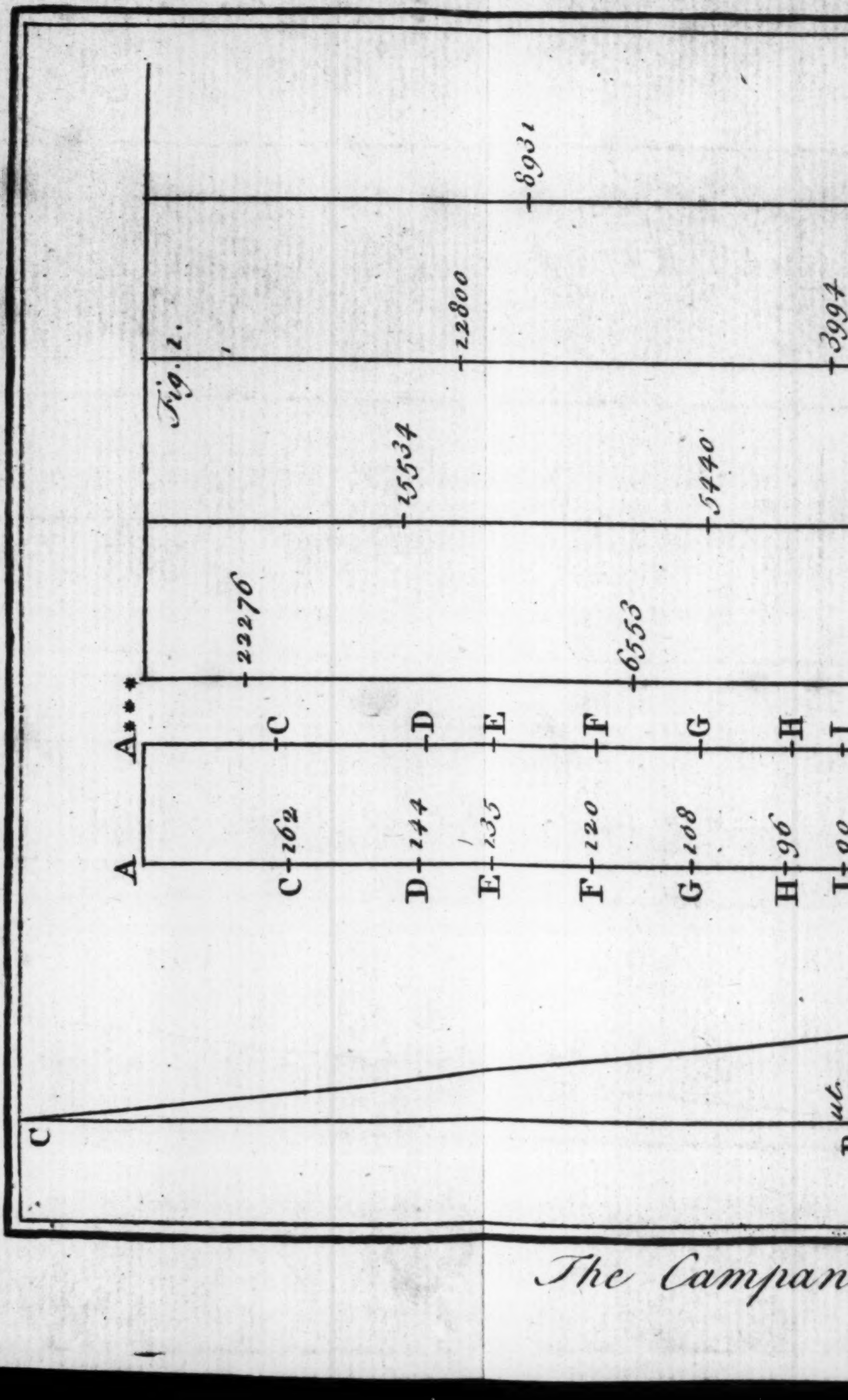
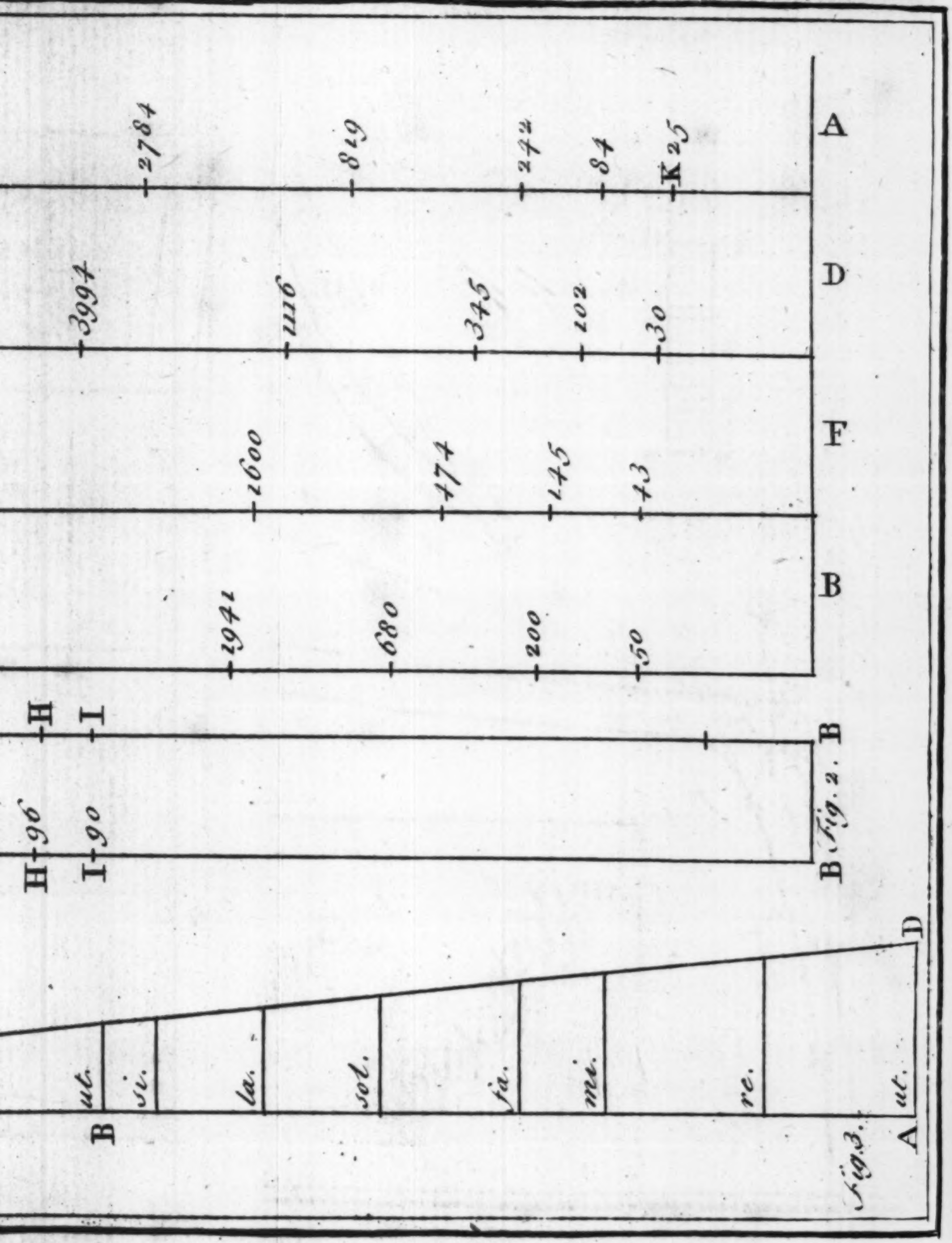


Fig. 2.
A
A**
C
D
E
F
G
H
C 162
D 144
E 135
F 120
G 108
H 96
22276
15534
22800
8931
6553
5440
3994
C
ut

The Campan



panary Scale.

PLATE XXVII.

The Meaſures or Proportions of Bells.

Fig. 1 The Draught or Meaſures of a Bell, according to the Method of Father *Merſenne.*

Fig. 2. The Draught or Specimen of a Bell, according to the Method that was communicated to me by Mr. *Cochu,* Organiſt of *Châlons* upon the *Marne.*

Fig. 3. The *Brochette,* or Diviſion of the Brim.

Fig. 4. The *Brochette* of the Weights and Thickneſſes, as it is uſed by Founders, with its eight Surfaces unfolded.

PLATE XXVIII.

The relative Proportions.

Fig. 1. The *Brochette* of the Thickneſſes and Weights, according to Father *Merſenne.*

Fig. 2. The *Brochette* of the Diameters. The Line **AB, with the harmonic Numbers, is the Rule of Father *Merſenne.* The Line **AB, without Numbers, is the Scale of the ancient Founders. The Difference, hardly ſenſible in little in the Intervals of theſe two Scales, becomes very ſenſible in large in the Execution.

Fig. 3. The Diapaſon or Scale of the eight Bells ABBC, containing the Tones, the Thickneſſes, and the Diameters.

moreover, that, the firſt and ſecond ſupporting Pillars having been pointed with freſh Mortar in all their Joints with the Walls of the Nave, where there were Sinkings and Vacancies, the Shaking, if there was any real one, was difficultly perceived; but, that it was felt ſenſibly enough in the third: Which is a Confirmation of what we have endeavoured to prove, and ſhews, that the Cauſe of the Shaking of the Steeples, and of the whole Church, is ſtill the ſame, though perhaps not increaſed.

PLATE XXIX.

The Mould and the Inſtruments for the Caſting of Bells.

Fig. 1. The lower Part of a Bell of four Feet, ſix Inches, and a few Lines in Diameter; and the Ruler AB with its Notch A.

Fig. 2. The Spatula.

Fig. 3. AA, BB, the firſt Leg, or the Profile of the Compaſſes.

ACBD, the ſecond Leg, or the Pivot of the Compaſſes.

AcB, a third Piece belonging to the Compaſſes, *viz.* the Piece of Aſſemblage.

EE, A Piece of Iron which the Pivot turns upon.

Fig. 4. The Pit and the Mould, &c.

Fig. 5. The Elevation of the Bridge, and of one of the Rings.

Fig. 6. A Plan of the Under-part of the Aſſemblage of the Rings. Thoſe ſeven Apertures convey the Metal into the Mould. The reſt is explained in the Text.

Fig, 7. The Furnace.

Fig. 8. The Profile of the Rings.

Fig. 9. The View of the Beam, with the two Pieces of the Belfrey which ſupport it.

PLATE XXX.

The View of the great Gate and of the three firſt ſupporting Pillars on the Southern Side of the Church of St. *Nicaiſe* of *Rheims*, to account for the ſingular Motion which happens in thoſe Pillars, when the ſecond of the four Bells of the neighbouring Tower, or the third of the Octave, is rung.

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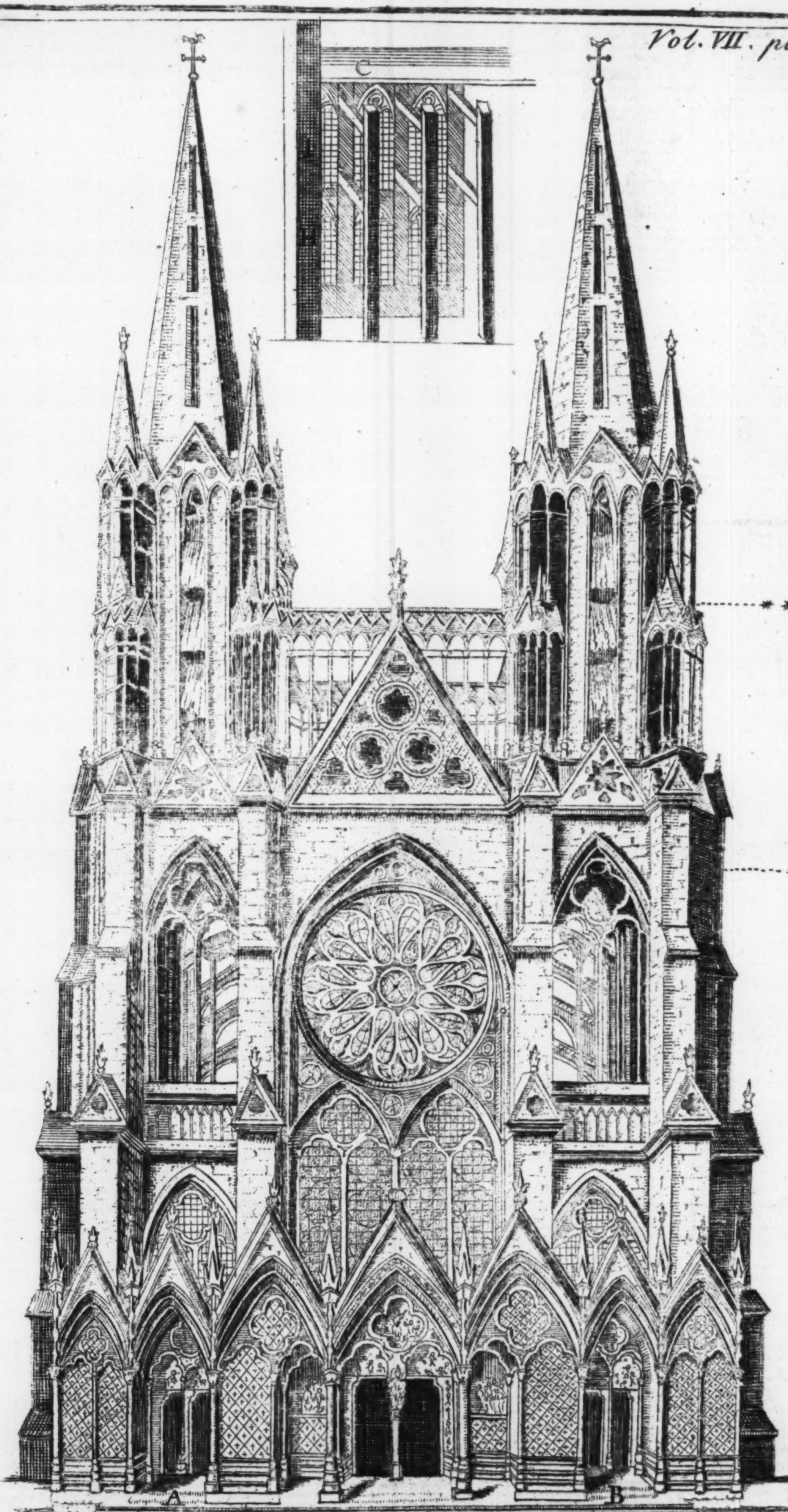


THE FRONT OF S^t. NICAISE OF RHEIMS.

A. The Northern Tower. B. The Southern. *. The Height of y^e Supporting Pillars or Buttreſses. **. The Height & Distance of y^e Bell. 2. C. The Buttreſses seen apart. I. The Windows of y^e Great Nave. H. The Windows of y^e collateral Nave. IH. Part of the Tower B.

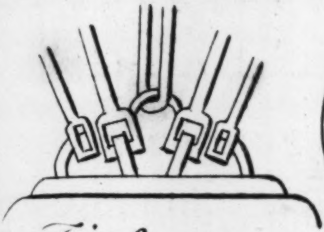
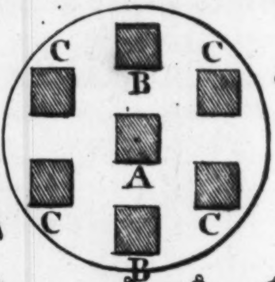


Fig. 8.



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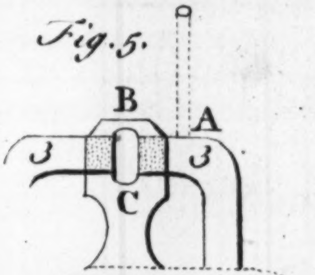


Fig. 5.

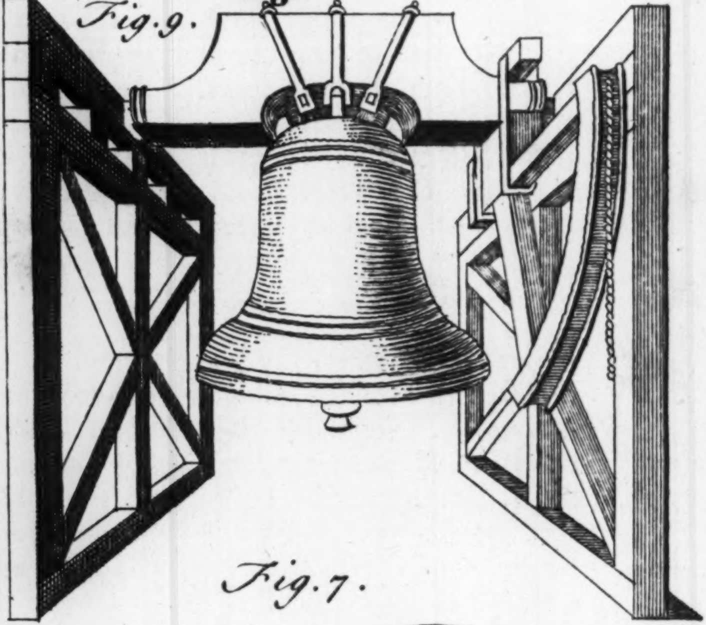


Fig. 9.

Fig. 7.

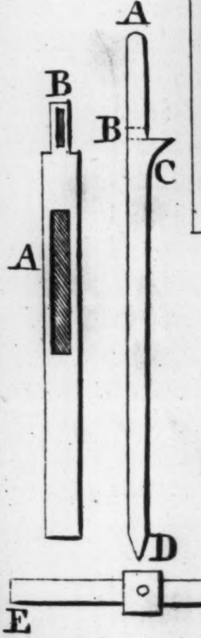
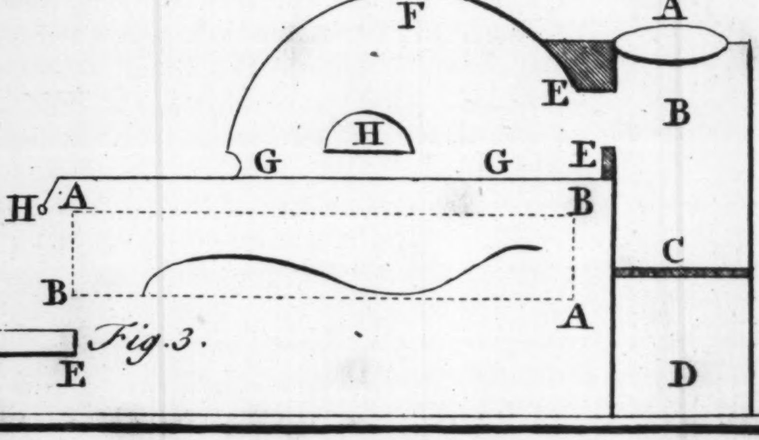
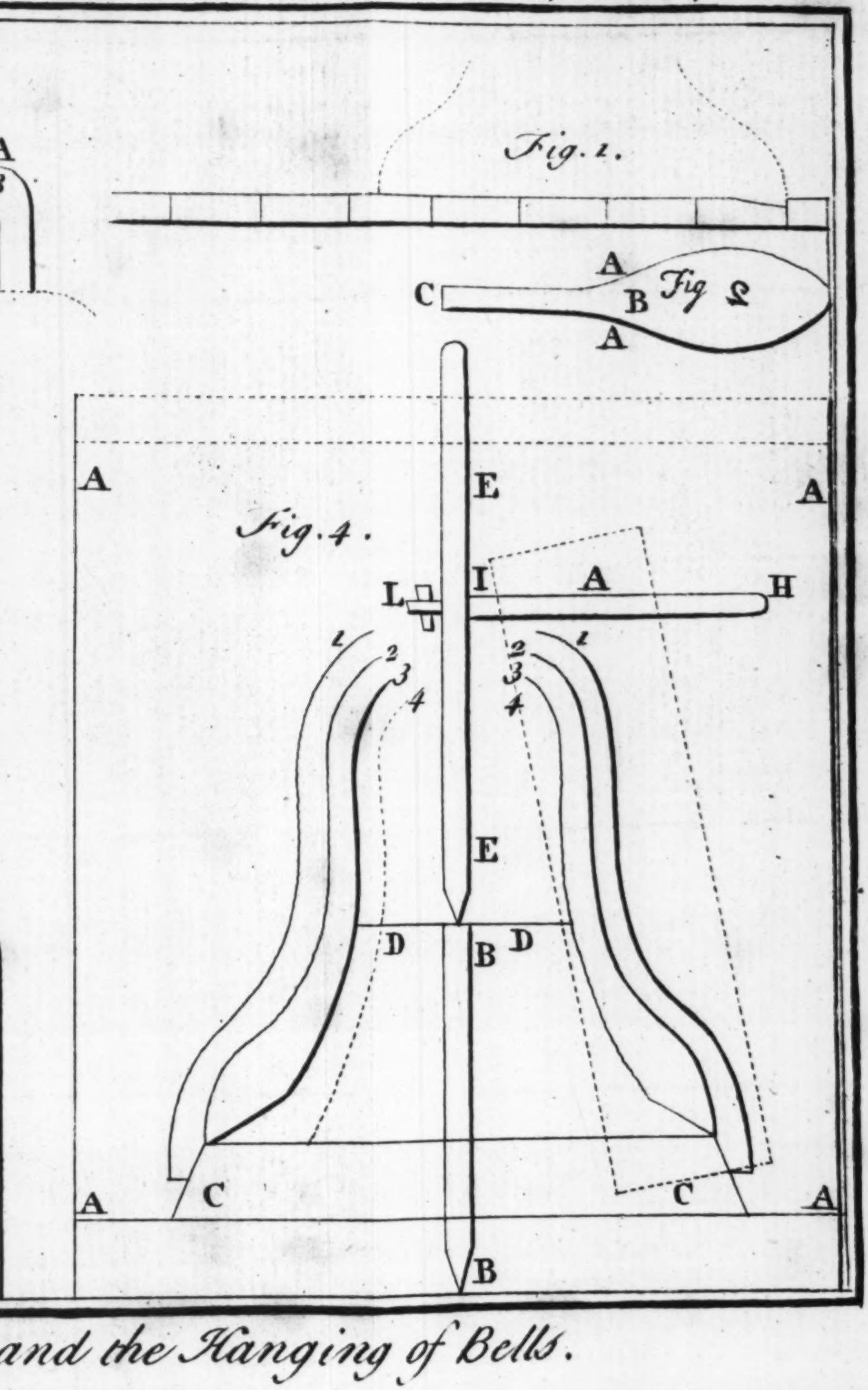


Fig. 3.



The Mould, the Casting and



and the Hanging of Bells.

DIALOGUE XXII.

The FIGURES *caſt in* BRASS.

THOSE large Baſſo-relievo's in Caſt-Metal, and thoſe magnificent Statues both on Horſeback and on Foot, which have for an Age or more encreaſed with the general Applauſe of the Public, are, in their Origin, no more than an unformed Mixture of very ſmall Grains of Copper and Calamin. What Patience and Dexterity muſt there be to purify them from a Multitude of heterogeneous Matters among which theſe metallic Grains were diſperſed, of binding them together ſo as to form with them Maſſes more ſolid than Marble, and of imprinting on them Strokes that will exhibit the great Men of our Age to Poſterity!

This Matter, ſo looſe, acquires immediately at the Fuſion a Tenacity inacceſſible to the conſtant Injuries of Winds, Rain, Hail, and Length of Time. Again, it is the ſame Tenacity which facilitates the Equilibrium and inſures the Stability of the Pieces of Caſt-metal which ſeveral Ways hang from the main Maſs, and a great Part whereof remains almoſt without Support. Such is the Head or Tail of a great Horſe in Braſs: Such is the Arm which a King or a General ſtretches out to give his Orders. This is what we admire in that fine Horſe which we ſee ſtepping under *Lewis* XIII in the *Place Royale*. 'Tis what we ſtill more wonder at in the Statue which the City of *Paris* cauſed to be erected in the Middle of the *Place de Louis le Grand*, in the Year 1699. The coloſſal Figure of the King and the Horſe, which was caſt at one ſingle Fuſion (a), and which ſupports a Weight of above ſixty thouſand Pounds of Braſs, has its total Support upon only three of the Horſe's Legs, notwithſtanding the Inflexion of the Houghs, which, it ſeems, ought to render thoſe Parts more brittle; and, in ſpight of the Agility of one of theſe three Legs, which is almoſt off the Ground. Add to this, that a full Third and better of this Maſs is neceſſarily ſuſpended in the Air, and owes its principal Conſiſtence barely to the Tenacity which unites it inſeparably to the main Body. But the Hardneſs of the Metal did not hinder the Artiſt from laying hold of it in an Inſtant of Pliantneſs, at which he found it as yielding as the Wax itſelf that ſerved him to expreſs and model his firſt Thoughts: And the Moment, when he governed that untractable Matter at Pleaſure, was the very Inſtant at which he had converted it into a Torrent of Fire. Let us endeavour in a few Words to give you an Idea of the eſſential Part of this curious uncommon Operation. As to the ſmall Works caſt in Braſs, which are moulded upon a very fine Mortar-ſand, or in Hollows, of Clay, or of other Matters, which have received the Impreſſion of a Model; the Thing is eaſily conceived, and the Working of them, which is agreeable, is every where levelled to our Capacity.

(a) There remained, after the Fuſion, a Maſs of one and twenty thouſand Pounds of Braſs out of the eighty-three thouſand which had been put into the Furnace. This Statue, which was modelled by Mr. Girardon, is one and twenty Feet high. That, whereof Mr. Le Moine has made the Model for the City of Bourdeaux, is likewiſe caſt at one ſingle Fuſion, and is fourteen Feet and ſeven Inches high. But the

The Principles of Architecture of Meſſ. Felibien and Boſrand.

The Caſting of Statues depends on ſix or ſeven chief Apparatus, *viz.* the Pit, the Core, the Wax, the Shell, or Outer-mould, the inferior Furnace, to melt and run off the Wax, and the upper Furnace to melt and pour the Metal into the Hollow that was left by the Wax.

The Pit,

1. The Pit is a Hole dug in a dry Place and ſome Feet deeper than the intended Statue is to be

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the Statue of Henry IV upon the Pontneuf, and that of Lewis XIII in the Place Royale, are each of two Pieces, caſt ſeparately, and then joined. The Pulpit of St. Peter at Rome, which is eighty Feet high, is an Aſſemblage of ſeveral ſeparate Pieces; and Mr. Boſrand, in his excellent Deſcription (printed by Cavelier) of the Caſting of the Statue which the City of Paris cauſed to be made in the Year 1699, is of Opinion, that the Coloſſus of Rhodes was an Aſſemblage of hammered Braſs-plates, like the Statue of the Conſtable of Montmorenci, which is at Chantilly.

be high. This Hole is either ſquare, or round, or oval according to the Out-jutting or Prominency of certain Parts which the Figure is to have. They line the Inſide of this Pit with a large ſtone Wall of regular Courſes.

They uſe another Method when the Statue is of an extraordinary Size, or when the Artiſt is deſirous to ſee the Effects of the Figures to be made in Wax, by looking at it at ſeveral Diſtances or Situations; or, when they apprehend the Inſinuation of the Waters which penetrate the Earth, and may reach the Work by riſing after heavy Rains. They, in this Caſe, work at full Liberty on the Ground-floor, and raiſe afterwards a ſtrong Fence above Ground, capable of reſiſting the Impulſion of the burning Metal, and of the Earth which is to be heaped within to the Top of the Work.

Whether it be intended to work level with the Ground, or at the Bottom of a Pit, they begin in both Caſes by conſtructing upon the Ground plot a Body of Maſonry in Bricks, brown Free-ſtone and Clay, under which they contrive a Furnace, when the Work is but of a moderate Size; or Galleries, that is, Spaces, ſeparated by Walls of Bricks, or of brown Free-ſtone, and fit to receive the Wood and Coals that ſhall be put in them here and there, to convey a ſufficient Heat every where, if the Work is conſiderable. This Body of the Baſis is covered, or even bound round with a ſtrong Iron grate, which makes the Whole perfectly ſteady. The Artiſt, from the Knowledge he has of the juſt Meaſures of the Piece intended to be caſt, takes a ſpecial Care to make the ſtrongeſt Bars of this Grate reſt upon the biggeſt Maſſes of Maſonry, to receive the large Pieces of Iron to be placed perpendicularly in them, which are to ſupport the Core, the Mould, and afterwards the whole Figure in Braſs, ſo as that nothing may bend and give Way. They lay over the Grate (all the Bars of which are three inches diſtant from each other) an Area of Bricks and Earth well beaten, to raiſe the Core on it. There is no Need of mentioning the Workhouſe or Roof, which is built over the Whole, to work under Cover, and which is all in Wood, except on the Side of the Furnace, where Maſonry is more ſecure than Wood.

2. The

The Core.

The Armature.

3. The Core is an unformed Maſs, to which they in groſs give the Attitude and Contours intended in the Figure. The Matter of this Core is of two Kinds. It is either a Mixture of Clay, Horſe-dung, and Hair, which form a Body both perfectly eaſy to be managed, and capable of acquiring in Time a perfect Solidity; or a Mixture of Parget and pulverized Bricks, which comes up to the ſame. This Maſs is inwardly croſſed from above downwards, and from Side to Side, with Iron-bars, that keep it firm and ſteady, and inſure a firm Support to any Thing to be applied over them. The Aſſemblage of theſe Iron-pieces is called the *Armature*.

The Uſe of the Core is not only to ſupport the Wax and the Shell which we are now going to mention, but alſo to ſpare the Metal, and diminiſh the Weight of the Maſs, by procuring a large Vacuity within it. Theſe Bars, and the Core, are either all, or Part of them taken out of the Inſide of the Figure in Braſs, by Means of an Aperture left in the Belly, or rather on the Back of the Horſe, and which is ſhut up after the Caſting, by melting or ſoldering a Piece of the ſame Metal on it, as well as on the other Holes left by all the main Iron-bars, placed either perpendicular, or acroſs the Figure, and which neceſſarily run through the Mould. I ſay, that theſe Iron-bars and the Core are to be taken off either wholly or in Part, becauſe there are within the Figure, when finiſhed, Places inacceſſible to the Hand of the Artiſt: And, ſecondly, becauſe, after having taken off ſuch of the Iron-pieces as were only deſigned for a tranſitory Support to the Core and Mould, they leave thoſe which the prudent Founder has prepared therein beforehand, to diminiſh, by a Kind of Equilibrium, the Effort of the Parts which ſupport the Figure, and procure a Support to the moſt prominent Parts without. Therefore they leave, in each of the three Legs of the Horſe deſigned to ſupport the Figure on its Baſis, an Iron-bar, that ſhall come out of the Inſide of the Leg and Hoof to be ſtrongly faſtened into the Pedeſtal. And as this Horſe is to appear ſtepping, ſo that he has two Legs on the Ground; one of the two others ſhall remain lightly in the Air without any Support; and, as to the Leg, which is leaſt remote from the

Ground, there will be a Neceſſity to let the Iron-bar which traverſes it, and contributes to the Supporting of the whole Maſs, come out. But this End of the Bar, which is ſhocking to the Eye, as it has the Look of a Stumbling-block, may be hidden with Art behind the Leaves of ſome Plant or other, which the Horſe is ſuppoſed to tread upon as he goes along. 'Tis what Mr. *Le Moine* had Recourſe to. Thus the Delicacy and Lightneſs of the Attitude is preſerved, without diminiſhing the Solidity. It will be likewiſe neceſſary, after the Caſting, to leave the Iron-bars of the Core, which contribute to the Steadineſs of the projecting Parts. For Inſtance; they will not fail to uſe a large Iron-curve faſtened with Cramps to the Bars coming inwardly out of the Horſe's Houghs on one Side, and croſſing the whole Inſide of the Tail on the other. Theſe Bars and Curve muſt, neither of them, be taken out after the Caſting. The ſame is to be obſerved with regard to another Curve, which is made to paſs from the Horſe's Mouth through the whole Head, and then come down along the Neck, to become a Support to this Maſs by being ſtrongly ſet into the Fore foot which ſupports the Fore-part of the Figure. Nor does this Foot bear up ſuch a heavy Maſs without the joint Help of the hind Houghs. The Iron-pieces coming out of the latter make but one Totality with the Bar which comes out of the Hough of the Leg before. The Horſe's Head could not then fall lower without raiſing the Bars of the Houghs behind the whole Weight of the Rump, which is charged with Weight chiefly on the Side oppoſite to the projecting Part of the Leg in the Air. Thus does the Whole remain in a State of Stability. Theſe Iron-bars are then intended to remain there for ever. The others and almoſt the whole Core are but tranſitory Scaffolds.

3. The Carver ſpreads over this Core a conſiderable Lay of Wax, which he makes two or three Lines thick at leaſt for Cabinet figures, and more in Proportion for larger ones. When the Wax is finiſhed with the Draperies, Attitudes, and Out-lines he has a Mind to give to the Braſs, the Figure may be expoſed a-new to the Obſervations of ſkilful Men, whereby to procure all proper Amendments and Corrections. The Shell, or Coar,

which, on Account of the Softneſs of its firſt Layers, will aſſume the Impreſſion and Form of this Wax, will preſerve the ſame faithfully, when Fire ſhall have cauſed that Wax to melt and run off intirely.

The Model and Mould of Plaiſter.

There is, for large Works eſpecially, another Method of making the Wax and Core, which conſiſts in having a Figure well finiſhed and altogether correct to ſerve as a Model. It may be made with Potter's-earth which is eaſily managed, or rather with Plaiſter when the Apparatus's of the Founding are to be of long Duration. By this Means you avoid the Inconveniencies of great Heat or Cold which never fail to alter the Clay, whereas they never cauſe the Parget to warp, or crack, This Model being in its Perfection, they clap upon it, by Piece-meals, ſeveral Pieces alſo of Plaiſter, which aſſume all the Out-lines of it exactly, and may be taken off without the leaſt Diſorder by Means of Oil-Olive and Tallow, which the Part to be imitated is ſmear'd over with. Theſe Pieces or Squares of Parget, regularly cut and taken off the Model, are called Hollows; the Reaſon of which Name is plain. They bring all thoſe Hollows exactly cloſe to each other upon the Model, ranging them by Courſes quite to the Top. You are ſure, by this Means, that they will unite very ſtrictly and take one into the other perfectly over the whole Figure. They are numbered, that the whole Aſſemblage of them may, when Need requires it, be transferred to the Core. They fill them with Wax after they have been rubbed with Oil, and they make the Wax of a Thickneſs proportionable to the Size of the Figure. This Thickneſs muſt be increaſed according to the Exigency of every Part. For Inſtance, the Horſe's Tail ſhall be but ſix Lines thick, to diminiſh the Weight of the Metal in that long Piece which is to remain in the Air. The Belly and almoſt all the reſt of the Figures ſhall be eight or ten Lines thick: But the Legs which are to carry the whole Weight ſhall be of maſſy Wax up to the Hough; ſo that the Legs will, when the Metal has taken the Place of the Wax, be likewiſe of maſſy Braſs, all but the Iron-bars which croſs them.

The Hollows.

The Buſineſs is now to aſſemble all theſe Pieces of Wax round the Iron-frame, which we call the Armature, and which reſembles a Skeleton placed upon the Area. After they have made ſure of a Plan by which all the Points, to which all the Extremities of the Hollows aſſembled upon the Model did perpendicularly correſpond, are expreſſed exactly, they, being directed by the References and Lines of this Plan, begin with drawing near each other again, and aſſembling the Hollows of the lower Part of the Figure garniſhed with their Wax, not neglecting the Caution of filling and exactly ſtopping with Wax the minuteſt Interſtices of the ſeveral Pieces. When they are joined, and make a firſt Incloſure as it were, the whole Inſide of it is filled up with Parget and liquid Brick. This, you ſee, is raiſing the Core and the Wax at once. Upon this firſt Courſe of Hollows full of their Wax, they raiſe a ſecond, the whole Vacuity of which is likewiſe filled up with Parget and liquid Brick, which is made to run every where betwixt the Bars of the Armature. Thus is the Core gradually advanced, as they go on raiſing theſe Courſes, till they cover the Whole with the laſt Hollows fill'd up with their Wax. Doubtleſs you apprehend that many of the Hollows or Squares of theſe Courſes, eſpecially in the lower Part of a Figure on Horſeback where Legs only are to be expreſſed, ſhall be dormant Pieces without any Out-lines or Wax, deſigned to ſerve as Supports to the upper Courſes and cover the Core, the Materials of which, though fluid at firſt, will harden in Time and ſupport themſelves together with the Armature, without being ſuſtain'd by this Incloſure of the Mould, which is to be remov'd and taken off the Wax. The Oil which is between the Hollows and the Wax facilitates the Removal of the former. The Sides of the Square-pieces, as well as their Jags and Notches which unite them, are alſo rubbed with Oil, to prevent their incorporating together. When all theſe Hollows are taken off, the whole Figure appears to the Eye in Wax. They mend every Part that wants to be reviſed, eſpecially along the Joints of the Hollows where the Wax could not inſinuate, without increaſing the Figure with protuberant miſhapen Lamina's.

When the Work is of a very large Extent, they take much greater Precautions, if they pleaſe: And this, in ſome Shape, is a third Manner of conſtructing the Core. They aſſemble the firſt Courſes of the Hollows and the Armature: Then they apply to each Piece of Wax, already lodged in its Hollow, one, two or three Layers of a Compoſition of Earth and Plaiſter, or of any other Mixture, according to the peculiar Talents of the Workmen. This Incruſtation is made about ſix Inches thick, drying up each Layer ſucceſſively with chafing-diſhes and a moderate Fire, ſo as not to melt the Wax. When you are arrived by Way of Application, and by the drying up of ſeveral Layers, at having an Incruſtation ſix Inches thick, making the whole Contour of the Core, you may ſupport it by an Arch of Brick, Earth, and Parget, to be conſtructed within it. A Paſſage contrived in this Arch conveys you down into it, to dry the whole very ſlowly. Then, the Under-part or Inſide of the Armature and Arch is gradually filled up, ſo as to compleat at laſt the whole Maſs of the Core, and make yourſelf ſure that the Incruſtation, with which the Under-part of the Wax is fenced, will every where be ſupported upon a ſolid Baſis without apprehending the leaſt Diſlocation or Bending any where. The Advantage of this Practice does not conſiſt only in being able to examine the Effect of the Wax by unloading the whole Figure of its Hollows, ſo that it may, as well as the Model, be openly ſeen in Wax; it conſiſts alſo in being able to diſplace and replace at Pleaſure, and leiſurely to correct all theſe ſquare Pieces of Wax numbered. It is the Buſineſs of the Founder to vary his Precautions, by foreſeeing every Exigency as well as the Effects. For Inſtance; before he finiſhes the ſeveral Maſſes of the Core, he will fix all the Pipes which muſt traverſe ſuch Places as will ſoon be inacceſſible. He puts ſupporting Pillars under the Extremities of the Bars of the Armature which go quite acroſs the Core. Whatever is liable to fall or warp, though ever ſo little, is by him ſtrengthened with Hooks, Iron-eſſes, and Wire, or even with a Wire Net-work, with which he ties the Core all round, faſtening the Net thereon with Nails driven into it to the very

Head. He, in ſhort, makes it his Taſk to procure every where the free Paſſage of the Metal together with a perfect Immobility in the Supports.

The Sinks, Spouts and Vents.

When the Wax-work is finiſhed, and every Part of it ſeparately corrected, by being compared with the correſponding Part of the Model; all theſe Pieces are placed again upon the Core, in order to fix in them ſeveral hollow Pipes of Wax, ſome of which riſe from every Part of the Figure, and have all their Extremities covered with the utmoſt Exactneſs and Care; others are directed downwards and ſideways. Theſe are called the Sinks, and will carry off all the Wax to be melted out of the Model. The others are called the Spouts and the Vents. The firſt are the largeſt, and are two or three in Number at Top of the Figure, and divide at Bottom into leſſer Branches, to carry the melted Metal into all the Parts of the Mould, of which we have not ſaid any thing yet. The Vents are Paſſages contrived at Top to let the Air freely out, whilſt the Metal runs into all the Channels that convey it downwards. Without this Caution the Air, violently dilated by the Heat of the Metal, would be inclined to fill up a much greater Space, and break the Mould for Want of a Vent, or form conſiderable Cavities in the Metal, which would be ſo many Holes or large Bubbles, capable of disfiguring the Work.

Before we begin the Mould into which the Metal is to run, let us not forget to obſerve that the Man, who works the Wax, knows exactly what Quantity of it he has prepared in a Maſs, and how much he imployed in the Hollows, the Sinks, the Spouts, and Vents; that the Founder may, for every Pound of Wax thus imployed, melt ſix Pounds of Metal, at leaſt, for the Caſting. I ſay, at leaſt, becauſe unforeſeen Loſſes may happen, which render this Proportion too inconſiderable, and the Part of the Metal which overflows, after having contributed to the even Rapidity of the Caſting, is no waſte Metal.

4. But, how ſhall we now preſerve the Strokes imprinted on the Wax, eſpecially ſince it is briſtling with

all theſe Pipes ſtanding up on End like the Quills of a Porcupine. This we are going to obtain, by means of the Mould wherewith the Body of the Figure and the Pipes are to be covered. This Mould is very different from the Plaiſter-mould, the ſquare Pieces of which ſerved, by their ſeveral Hollows, to model the Wax-work. The Mould in Queſtion is alſo of a Piece; but it is made ſlowly, at ſeveral Times, and by Layers which are at firſt as thin as a Varniſh, and then gradually made thicker and thicker, till they at laſt form a ſolid Mould, ſtill containing in Hollow all the Strokes and Out-lines that were ſeen in Relievo on the Figure.

The Mould of Putty.

They, for that Purpoſe, begin by making a Putty or Compoſition of fine Earth, and of Earth of old Crucibles, well pulverized upon Marble, and finely ſifted. Some add to it Horſe dung and Urine, which they macerate, leaving it to rot with the ſaid Earths, in order to pound and ſift the Whole at ſeveral Times. This Compoſition being diluted with Water and Whites of Eggs, they dip a Pencil into it, and therewith ſpread a firſt and very thin Layer over the whole Figure and the Wax pipes. The firſt Layer being very dry, they put another with the ſame Matter and Inſtrument. A little Hair may be put into the Compoſition at the fourth or fifth Layer. Thus they go on ſpreading ſucceſſively ten, twelve, and even twenty, or more Layers, one upon another, never making any new one before the foregoing is ſufficiently dried. When this Incruſtation is near half an Inch thick, it is Time then to thicken the Compoſition. They incorporate with it the red Earth, mixed with Plaiſter, gradually diminiſhing, and at laſt totally ſuppreſſing, the fine Earth, and the Cement of pulverized Crucibles. The laſt Layers are ſo ſubſtantial, that they become a perfect Maſonry, which is outwardly ſtrengthened by ſeveral flat Bars, firſt ſituated in an erect Poſition, and then bent according to the Curvatures of the Mould, and then by ſeveral Iron-hoops, which imbrace and collect the Whole together.

They are vaſtly attentive to make the firſt Layers of the Mould, which are in an immediate Contact with the Wax, of the utmoſt Fineneſs, becauſe they moſt faithfully receive the Strokes and Outlines of the Figure, and acquire a greater Binding in the ſecond Baking to be made of the Core and Mould.

5. If the Work is but of a middling Size, they are contented with a Furnace placed under the Grate which bears all the Work. A moderate Fire, continued one or two Days, will ſuffice to melt out all the Wax, which is received in Veſſels placed at the Extremities of the Pipes called Sinks, which come out at the inferior Part of the Mould. Then they increaſe the Fire, which penetrates the Pit with Shards of Tiles or Bricks, quite above the Mould. Then they increaſe the Fire, which penetrates the Area, the Core and the Mould. The Smoak goes out through the Brick-ſhards, which concenter the Heat ſo as to redden the Core and Mould a ſmall Matter. This they make themſelves ſure of by means of a Pipe made of Iron-plates, which was beforehand introduced into the Mould through a Hole bored with an Augur. This Hole, which is to be ſtopped in Time, as well as thoſe of the Bars of the Armature, helps the Workmen to ſee through the Iron-plates, the Brinks of both the Mould and the Core, which cannot grow red-hot without caſting a Glimpſe of Light ſufficient to render them viſible in the Dark.

When the Largeneſs of the Work has made it neceſſary to ſubſtitute Galleries to a Furnace, in order to diſtribute the Fire on all Parts, they raiſe in the Pit, at the Diſtance of one Foot round the Mould, a Brick-wall as high as the Mould, which is called the Baking-wall. They leave ſeveral Holes in it. which are ſhut up at pleaſure with an Iron-plate. Between the Baking-wall and the Wall with which the Sides of the Pit were lined, or which has poſſibly been built upon the level Ground, there is a free Paſſage every-where, to put the Fire, when you pleaſe, under the Galleries, through the Apertures of the Baking wall. All the reſt of the Inſide of this Wall is filled up with Brick-ſhards, to concenter and increaſe the Heat. The firſt Fire carries off the Wax. The inferior Parts feel its firſt Influences, and get firſt into the Veſſel placed without the Baking-wall purpoſely to receive them. The Upper-parts of the Wax run ſucceſſively into the ſame Veſſel, the Heat ſearching and making them run out one after another. The Horſe, the Man, his Dreſs, and the Pipes, are all of them carried off and deſtroyed, and there remains but an empty Space between the ſhapeleſs Maſs of the Core and the Outer-mould, which has preſerved and retained the Impreſſion of both the Figure and the Spouts. The Wax, which may have been imbibed by the Mould and Core, will evaporate in the Baking. All the Wax is taken away, and the Sinks perfectly well ſtopt; and the Fire, which is then conſiderably increaſed, and kept up for ſeveral Days, at laſt renders the Mould and Core red hot: Of which the Workmen being ſure, by inſpecting through the Iron-plate-pipe, the Baking is completed. The Fire is now taken away as well as the Brick-ſhards, in order to fill up with Earth the whole Pit or Place, ramming that Earth down from Lay to Lay, ſo as that one Layer of ſix Feet may become but four Feet thick. It is a good Caution to mix a little Parget with the ſaid Earth, becauſe the former will imbibe the whole Moiſture of the Earth, and hinder it from hurting the Mould by inſinuating into it Particles of Water and Air, that might, at the Approach of the Heat, dilate and burſt all, for Want of an Iſſue to vent out of, or a Space to diſperſe. We ſometimes arrive, after two or three Years of Trouble, at the Point of the Caſting, when we have made ourſelves ſure at laſt, that the Baking of the Mould, as well as the Filling up of the Hole, have given the Core, the Mould of Putty, and the Pipes which convey the Air out, an unſhaken Situation, which the Torrent of melted Metal will never be able to break or alter.

6. The upper Furnace, where the Fuſion of the Metal is to be made, is ſituated by the Pit, and two or three Feet higher than the Top of the Mould. The Diſtance from the Pan to the Furnace muſt be very little, leſt a Part of the Metal, expoſed to the Air, ſhould grow cold in the Running, and ſuddenly ſtop the Flowing of the reſt, which would make the Furnace miſcarry.

The upper Furnace.

The Furnace conſiſts of a Hearth and its Muff, and has beſides a Fire-place, an Aſh-place, and an Earthen-baſon. The Hearth and its Brinks are covered over with a fine Earth well beaten, not to leave any Iſſue to the Metal in Fuſion.

The Weight of a cubic Foot of Braſs Metal is known, as well as the Room it will fill. Knowing then how many Pounds of Metal muſt be put in Fuſion, you know how many cubic Feet the whole will make, and that Knowledge is your Rule to make the Bottom of the Furnace of a Capacity ſufficient to contain the Metal to be put into it.

The Muff of the Furnace is an Arch of Brick which is made very low, the better to reverberate and direct the Flame upon the Maſſes of the Metal. This Arch has four lateral Apertures correſponding to each other, and two ſmall Chimnies at Top, freely to vent out in Time the thickeſt Smoke, which, being full of Moiſture, might granulate and fix Part of the Metal in Fuſion, which is called the Caking of the Metal. The firſt of the four lateral Apertures is that of the Canal that carries the melted Metal over the Mould. It is ſtopt within with a large Iron Flood-gate, but ſo as not to let it fly off without, though they may at any Time have it within again by puſhing it with a Bar. This Aperture is ſtopt with a Piece of Iron, becauſe Iron is the leſs fuſible of all Metals, and the Degree of Heat, that will melt Copper, is not ſufficient to put Iron in Fuſion.

The Aperture oppoſite to the Canal is that which receives the Flame from the Fire-place to diſtribute it over the whole Hearth, and carry it quite to the Canal, where its Direction is broke, to make it fall upon the Metal. The two Apertures, which are on the other two Sides of the Arch, are deſigned partly for the carrying off the thick Smokes, but chiefly for the Stirring of the melted Metal; which is done from Time to Time, during the Fuſion, with Wooden-rakes, which conſiſt of long Alder-poles, or of long Iron-handles terminated with a Board in the Manner of a Gardener's Rake. They introduce theſe Rakes through the two Apertures, to ſeparate whatever remains thick in the Fuſion, to diſſolve the Cake if any ſhould be formed after the Fuſion is begun, and take out the Droſs ſwimming upon the Metal. Theſe Apertures and the two Chimnies have Iron-plate-doors ſliding in Grooves, that they may be ſhut at the Pleaſure of the Founder.

The Fire-place is a ſquare Building of Brick or Tile, deeply ſunk into the Earth by the Side of the Furnace or Oven juſt mentioned. It is divided by a ſtrong Grate into two Parts, the inferior of which is called the Aſh-place, and is appointed to receive the Aſhes which fall from the Grate, and to admit a Draught of Air fit to render the Fire briſker. The upper Part is properly the Fire-place, becauſe it receives and conſumes the Wood which is flung into it upon the Grate. It has two Apertures at Top, one ſmaller and covered with an Iron-plate which is lifted up to put in the Wood, and let down again, to ſtop all Paſſage to the Flame, which it is neceſſary to convey ſomewhere elſe: The other larger, which conſiſts of four Walls which bend and grow narrow ſideways, that they may be jointed into the Aperture of the Arch, through which the Flame will diſperſe all under the Arch, and be perpetually reflected upon the Metal.

The Baſon, which is made of a fine compacted Earth, is of the Form of a long Square, having a Communication with the Canal of the Furnace before which it is placed. The Hearth and Canal muſt be a ſmall Matter higher than this Baſon, and have a Bias fit to hurry the melted Metal down into it. Care is taken, before burying the Work under Ground, to bring quite to the external Air the Jets and Vents made of the ſame Matter with the Mould of Putty, and to fence them with Iron-plates to avoid their being broken. The Earthen-Baſon, which has as many Holes bored in its Bottom as there are main Jets, is laid at Top of the Mould, ſo that its Holes, which have the Form of wide Cups, unite at their inferior Aperture with the Orifice of each Jet. The Vent-pipes come out into the Air, and terminate all round the Sides of the Earthen-baſon. The Cups at the Bottom of the Earthen-baſon are ſhut up with long Handles terminated each of them by an Iron-nipple fit to fill exactly the round Cavity of the Cup into which the Metal is to be received. All theſe Handles being faſtened at one End and in an erect Poſition to a Croſs-iron bar which is lifted up or let down at Pleaſure by Means of a Sweep, one ſingle Word or Signal is enough to cauſe all the Cups to be unſtopped all at once.

A Chain ſuſpended over the Canal keeps in a Sort of Equilibrium the Inſtrument which is to unſtop the Canal. This is a long Iron-bar, or a ſtrong Pole garniſhed with a Maſs of Iron. If, with this Bar put in Motion and having its Maſs over-againſt the Canal, you puſh the Flood-gate quite into the Furnace, the Metal will run out.

You firſt ſee very white Smoke coming out of the Furnace, which is the Sign of a Metal thoroughly melted. At this, the Rakes are taken away, and the Iron-plate Doors of the two Apertures are let down and ſhut. A couple of ſtrong Fellows lay hold of the above-mentioned Iron-bar; and two more ſeize the Ropes of the Sweep that works the croſs Iron-bar up and down. All their Eyes are fixed upon the Maſter-founder.

The latter lifts up his Cane; the long Iron-bar, ſuſpended on the Chain is immediately directed towards the Orifice of the Furnace, and with one or two Blows of it the Flood-gate is thrown in quite to the Bottom of the Hearth. The Metal guſhes out, fills the Earthen-baſon, and preſents itſelf to the Cups which it finds ſtill ſhut up. In the mean Time, the Sweep aſcends with the croſs Iron-bar and the Stoppers of the Cups. The Torrent of burning Braſs runs precipitately down through the Jets into the whole Cavity of the Mould. No Accident offers to ſtop it. The Baſon goes on filling up and emptying ſucceſſively. The Furnace is already almoſt exhauſted of melted Matter, and the Founder, ſtill uneaſy on Account of the Accidents that may happen to his Metal under Ground, has at laſt the inexpreſſible Satiſfaction of ſeeing it overflow the Earthen-baſon: Upon which he retires, all being done on his Part.

Every Part of the Apparatus, having now done its reſpective Service is removed at laſt. The Pig of Metal remaining in the Earthen-pan is carried away; the Earth of the Pit is digged out, and the Furnace, the Shell, and the Mould of Putty broken to Pieces. The Statue now viſible is ſet on Foot with Engines, and all proper Cautions uſed to avoid breaking any of the ſlighteſt or projecting Parts: It is delivered into the Carver's Hands, who begins with ſawing off the Pipes it briſtles with. Then he arms his Workmen with Picks and Puncheons, with Scrapers of all Sorts, with great and ſmall Chiſels, and with round, flat, and ſharp Gravers. Every Thing is cleanſed, all the Incruſtations, Swellings, and Unevenneſſes are flatted down. He places, by his Men at Work, the Model which he has preſerved at leaſt in ſmall, and which regulates one of them. He reſerves for himſelf the ſtrict Examination of the Strokes he has moſt at Heart to finiſh, for fear they ſhould be either altered or overlooked by a Hand leſs cautious than his own. When the Work is thoroughly cleaned off, and of the utmoſt Correctneſs, they do it over with a Varniſh, which gives the ſame uniform Look to the whole Body, and the Pieces of Braſs or Solder applied afterwards.

Such is of all Arts that which moſt nobly rewards the Services done to Society. It is the Part of thoſe, who have the higheſt Ranks in it, to procure it the greateſt Supports. They expect no other Acknowledgements but Affection and Applauſe. However, it becomes them much to unite and make extraordinary Efforts, not only to expreſs their Gratitude, but alſo to render that Expreſſion as laſting as the Favour they have received. When the *Cæſars* returned from their warlike Expeditions, the City of *Rome* erected to their Honour Monuments capable of reſiſting the Injuries of Time. Thoſe made of Braſs were preſerved beſt of any. But, although every Age be entitled to indulge its own peculiar Taſte, ought we not to fear for ourſelves the Reproach which Futurity may caſt upon us of having preferred, in the Teſtimonies of our Gratitude, the Taſte of Glittering Bawbles and *Ignes fatui* to that of real and permanent Beauties? We are fond of Noiſe and Tinſels: And we ſometimes lay out more Money to ſee, during Half a Quarter of an Hour at moſt, a Caſcade of Fire run down, and be ſucceeded by a two-minutes Sun, or by a Deluge of Fire-ſerpents whoſe Vaniſhing terminates the Solemnity, than was formerly paid for caſting in Braſs the great Horſe and Figure of *Marcus Aurelius*, or for the erecting of the Columns of *Trajan* and *Antoninus*, or for conſtructing triumphal Arches, where the Exploits of *Titus* and *Conſtantinus* are ſtill exhibited to us.

That our Affection for a King full of Activity and Humanity ſhould break out, is an Effuſion of Heart which it would be neither poſſible nor reaſonable to ſtop. But, inſtead of being contented with Solemnities which are nothing but Noiſe and inſtantaneous Vapours, we ought to proclaim our Joys to all future Ages, and hand them down to remoteſt Poſterity by Realities of ſome Service. The Places, which are moſt neceſſary for the Exigencies of a large Town, may there become proportionable Embelliſhments, as well as Monuments of public Gratitude. Our moſt crooked and cumberſome Market-places may be rendered larger, and aſſume Forms no leſs regular than commodious. Setting the meaner People at eaſe in their Works, is promoting the Service they may reſpectively do us. Inſtead of ſpacious Shambles ſituated along the Courſe of the River below the City in the *Iſle des Cignes*; or, inſtead of a new Market built upon the Ground of the *Hotel de Soiſſons*, one might chuſe to build in the ſimpleſt Manner a Work-houſe, where unfortunate People might at any Time be ſure to find Employment when they wanted it. Or, if it was determined, that the Expence deſtined for a Solemnity ſhould be intirely beſtowed on Works of meer Decoration, one might make a Preſent to the People of a covered Walk, and place there a long String of Statues, fitter than even Books, to teach them the Hiſtory of the great Men who have ſerved their Country well, either in War, in Government, or in Point of Arts. Such a Sight as this would be an Encouragement as well as the Amuſement of People of all Conditions, and the empty Pedeſtals would become ſo many deſirable Stations. But, let the public Funds be beſtowed upon what Work you pleaſe, let it be a Market, a Walk, a Sewer, a Gate, a Wharf, a Fountain, a braſs Reſervoir or Baſon; all theſe, or any other Works uſeful to the Public, being named every Day and every Inſtant, ſeem therefore to be purpoſely made to illuſtrate great Events and great Names. This will be the Market of *Conti*, the Portico of the *Bourbons*, the Work-houſe of Recovery of Health: That will be the Arches of *Fontenoy*, *Saxe*'s Bulwark, or the Pomps of *Lewis* XV.

Let us however reſerve the Statues in Braſs, and the largeſt Monuments for our Kings, and, with the Leave of the latter, for the other Warriors, who have been the Preſervers of the State. But, there is a pacific Patriotiſm; there are Projects and Cares wherein the pure Love of one's Country ſhines out in the brighteſt Manner, and which the Public might acknowledge by Medals, Carvings and Relievos, or by honourable Inſcriptions. Of all the Inhabitants now living in the City of *Paris*, is there one that would not be overjoyed to ſee, in the fineſt Place of the Bulwark, a Braſs-table in Relievo, that might now and forever exhibit the Features and recall to every Mind the Name of the moſt lovely of our Provoſts *?

Nor would Juſtice and Love fail to remind us in the ſame Manner of thoſe Magiſtrates, who burning with the like public Zeal, and always working Hand in Hand with their Chief as well as among themſelves, though ever oppoſed by Obſtacles from without, which were multiplied from Day to Day, yet have at laſt conveyed and cauſed the foul Waters of an immenſe City to run down into the Channel of the River: An Undertaking parallel or even ſuperior to that which is ſtill the Glory of the fifth King of *Rome*. A Stone-canal but little inclined upon a League of level Ground, together with a Fall of Water powerful enough to hurry the collateral Branches and all the ſtanding Waters with itſelf into that Canal, were the Means by which theſe Fathers of the People have reſtored the Air of *Paris* to its Purity, their Fellow-citizens to the Uſe of the public Walks which were formerly infectious, and procured Joy and Health to above three hundred thouſand Inhabitants of both the Country and the fineſt Part of this Metropolis.

Great *Turgot*, I here pay you the pureſt Homage. I am no otherwiſe beholden and attached to you, than like a Million of other Citizens who now ſhare the Enjoyment of this glorious Work and of your other Preſents. But, why ſhould Gratitude affect us only in Things perſonal to ourſelves? Nay, it is the very Extenſiveneſs of ſuch a Favour which affects me moſt: And, were I a Poet or a Founder, you ſhould already have had from me Thanks as durable as your Undertakings.

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* The Mayor of Paris is called the Provoſt of Merchants, or of the Iſle of France.

DIALOGUE XXIII.

The fourth Sequel *of* INSTRUCTIVE ARTS.

THERE being a Neceſſity to make a Choice and ſet Bounds to our Remarks upon the moſt Inſtructive Arts, we ſhall conclude them with the Operations of Coining and Clock-making, which are alſo two of the beſt Means of introducing Order into Society, by giving Men Advices they ſhould not be without.

Coin.

Coin, in its Origin, is a ſmall Maſs of Gold, Silver, or Copper, of a determined Weight, deſigned to facilitate the Acquiſition of Neceſſaries, by exchanging them with an eſtimable and incorruptible Matter. The Neceſſity the ancient Traders were under of having moſt commonly a Pair of Scales about them to weigh the Things exchanged, or to be certain of the Quantity of the Metal ſubſtituted in lieu of them, engaged the Cities of great Reſort, or the Princes and Governors, to cauſe theſe precious Metals to be divided ſometimes into cylindrical or long flat Pieces, ſometimes into Cakes of different Weights, and to ſtamp them with a Mark well known and agreed upon, that might expreſs the Weight and Quality of the Metal. This was an Advertiſement[*] and a Warrant or Security, the Certainty of which increaſed with the Difficulty of counterfeiting the Mark of the Prince; and, by an happy Event, which they had not in View at firſt, theſe Pieces made a Courſe of Monuments, by which the Knowledge of diſtinguiſhed Places, Times, and Perſons was handed down to Poſterity.

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[*] Moneta, from monere, to adviſe, to advertiſe.

Theſe Uſes of Money appeared in Time ſo very advantageous, that they ſtamp new Coins purpoſely to eterniſe the Memory of a great Event by a peculiar Mark, or to preſerve the Features of a beloved Prince. They have even ſtamped in Antiquity, as they ſtill moſt commonly do, Pieces deſtined, not indeed to be current in Commerce, but to expreſs the Gratitude of either a Town or a Corporation, or to perpetuate the Memory of ſome remarkable Event. They, in that Caſe, are called *Medals*; or *Medallions*, when they are of a large Size. The current Coins of the Antients are alſo called Medals, when they are gathered for Inſtruction, and to make hiſtorical Collections.

Theſe Collections are the true Repertories of the Charters of ancient Hiſtory, and the fitteſt Means to procure a Science truly ſolid, on account of the Certainty of its Vouchers. Very few Matters have been better written upon, and this Study, and natural Hiſtory, are the moſt important Branches of Learning. I have often heard judicious learned Men, truly fond of Antiquity, complain of the few who had a Liking for Hiſtory juſtified by cotemporary Monuments: Theſe Complaints were the better grounded, as the Libraries, the Cabinets of Medals, and the Collections of Monuments are neither rare among us, nor ſhut up to the Curious. They ſometimes attributed this to the Defects of public Education, in which they ſaid young People were ſcrupulouſly taught what a Creſt or a Gryphus are, or the *Vis inertiæ*, and the pretended Reaction of a Stone upon the Horſe who drags it along; whilſt not ſo much as one of their Maſters had thought of throwing into their Mind the firſt Seeds of the nobleſt Curioſity, by ſhewing them in reality, or at leaſt in Print, the Heads and Reverſes of a Series of Imperial, Gothic, Byzantine, or other Medals. Sometimes theſe Virtuoſo's lay it to their own Charge, and accuſe themſelves of the groſſeſt Miſtake, not to have every where encouraged the Love and Search after Antiquity, by the Help of Cuts; one taking upon him to be at the Expence of a certain Plate of Medals, another of another; or by advancing, in common, the Expence of a fine Collection of engraved Heads, Temples, Tombs, Inſtruments, and Monuments of all Kinds;

which would encourage the Work of the Engravers and make it an eaſy Matter to ſet on theſe uſeful Collections ſuch a ſmall Price as would entirely prevent their being counterfeited. It would be very difficult, indeed, to do greater Services, and make better and finer Preſents to Society than theſe.

Nor is hiſtorical Certainty the only Benefit reſulting from the Inſpection of the Monuments and Vouchers of Truth. The great Service done to Mankind, by procuring Cuts to thoſe who cannot well have the Monuments, conſiſts in facilitating the Progreſs of all the polite Branches of Learning, and in promoting a nice Diſcernment. The Learned are ſaid to be commonly enough deſtitute of a delicate Taſte: Which is not to be wondered at, in People who no ſooner have done with the grammatical, but they launch headlong into Metaphyſics; whereas the Study of Antiquity gives them a liberal Underſtanding, by the Pleaſure annexed to theſe rational Objects. All vaniſhes and ſlips from our Memory in a cold Reading; but every thing remains there in good Order, when it is connected with the Features of an Emperor, with the diſtinctive Mark of a Colony, with the Decorations of a ſecular Year, a triumphal Entry, or a happy Return. The Study of Hiſtory is a Voyage which we cauſe our Imagination to make into diſtant Countries, or through remote Ages. Every Thing is engaging to us there, in Proportion as the Objects are brought under our Eye.

Of all Monuments, Coins have been chiefly multiplied, on account of both their Neceſſity and ſmall Apparatus. They alſo have been beſt preſerved of any, on Account of the Hardneſs of their Matter; and the very Order of their Series renders them fitter than any to become the Connection of Events.

The ancient Fabric of Coins.

Formerly the Fabric of Coins was different from what it is at preſent. They cut a large Plate of Metal into ſeveral little Squares, of which they cut off the Corners with Shears. After having ſhaped theſe Pieces, ſo as to render them perfectly conformable in Point of Weight to the Standard-piece, that was the Rule of all the others, they took each Piece in Hand again, to make it exactly round by a gentle Hammering. This was called a Planchet, and was fit for an immediate Coining. Then Engravers prepared, as they ſtill do, a Couple of Maſſes of Steel, in Form of Dies, cut and terminated by a flat Surface, rounded off at the Edges. They engraved or ſtamped on it the Hollow of a Head, a Croſs, a Scutcheon, or any other Figure, according to the Cuſtom of the Times, with a ſhort Legend. As one of theſe Dies was to remain dormant, and the other be moveable, the former ended in a ſquare Priſm, that it might be introduced into the ſquare Hole of the Block, which, being fixt very faſt, kept the Die as ſteady and immoveable as any Vice could have done. The Planchet of Metal was horizontally laid upon this inferior Maſs, to receive the Stamp of it on one Side, and that of the upper Die, wherewith it was covered, on the other. This moveable Die, having its round engraved Surface reſting upon the Planchet, had, at its oppoſite Extremity, a flat, ſquare, and larger Surface; upon which they gave ſeveral heavy Blows with a Hammer of an enormous Size, till the double Stamp was ſufficiently in Relievo on each Side of the Planchet. This, being finiſhed, was immediately ſucceeded by another; and they thus became a Standard coin, which had the Degree of Fineneſs, the Weight and the Mark, determined by the Judgment of the Inſpectors, to make it good current Money. The ſtrong Tempering which was, and is ſtill given to two Dies of Steel, rendered them capable of bearing theſe repeated Percuſſions.

Modern Coining.

Coining has been conſiderably improved, and rendered expeditious by ſeveral ingenious Machines, and by a wiſe Application of the ſureſt phyſical Experiments to the Methods of fining, dying, and ſtamping the different Metals. We may very well overlook here the Detail of the minuteſt Practices of Coining, which it is neither difficult nor important to know; it being enough for us to conſider the Effect of the Machines belonging to the Art of the Mint-Man. Here follows a ſhort Deſcription of the Work of the three fineſt Inſtruments he uſes, *viz.* The Laminating-Engine, the Machine to write on the Edge of Coins, and the Mill.

The Laminating-Engine.

After they have taken the Laminæ of Metal out of the Mould into which they are caſt, they do not beat them on the Anvil, as was formerly done; but they make them paſs and repaſs between the ſeveral Rollers of the Laminating-Engine; which, being gradually brought cloſer and cloſer to each other, preſently give the Lamina its uniform and exact Thickneſs. Inſtead of dividing, as before, this Lamina into ſmall Squares, they at once cut clean out of it as many Planchets as it can contain, by Means of a ſharp ſteel Trapan, of a round Figure, hollow within, and of a proportionable Diameter to ſhape and cut off the Piece at one and the ſame Time. After theſe Planchets have been compared and weighed with Standard-Pieces, then filed, or ſcraped, to get off the ſuperfluous Part of the Metal, and then boiled and made clean; they in a Courſe of Rooms arrive at laſt at the Machine, which marks them upon the Edge, and finally to the Mill, which, ſqueezing each of them ſingly between the two Dies brought near each other, with one Blow, forces the two Surfaces or Fields of the Pieces to fill exactly all the Vacancies of the two Figures engraved hollow. The Engine, which ſerves to laminate Lead, gives a ſufficient Notion of that which flattens Gold and Silver Lamina's between Rollers of a leſs Size. I ſhall content myſelf here, with taking Notice of the Figure of the Machine which ſerves to ſtamp the Edges of Coins, and of that of the Mill.

The Machine to ſtamp Coins on the Edge.

Boizard's Treatiſe on Coins.

I. "The principal Piece of the Firſt "are two ſteel Laminæ, about a Line "thick. One half of the Legend, or of "the Ring, is engraved on the Thickneſs of "one of the Lamina's, and the other Half "on the Thickneſs of the other; and "theſe two Laminæ are ſtrait, although the Planchets "marked with them be circular.

"When they have a Mind to ſtamp a Planchet, they "put it between the Lamina's, in ſuch Manner, as that "theſe, being each of them laid flat upon a Copper-"Plate, which is fixed and faſtened upon a very thick "Wooden-table, and the Planchet being likewiſe laid

“ flat on the ſame Plate, the Edge of the Planchet may
“ touch the two Lamina's on each Side, and in their
“ thick Part. One of theſe Laminæ is immoveable,
“ and faſtened with many Screws; the other ſlides by
“ Means of a dented Wheel, which takes into the
“ Teeth, which are on the Surface of the Laminæ.
“ This ſliding Lamina makes the Planchet turn in ſuch
“ Manner, that it remains ſtampt on the Edge when
“ it has made one Turn. You are to obſerve, that none
“ but Crown or Half-Crown-pieces can be ſtampt with
“ the Legend, *Domine ſalvum fac Regem*; becauſe the
“ Size of them ſuffices to make them bear the Impreſſion
“ of Letters on the Thickneſs of their Edge,
“ whereas the Size of the other Pieces, both Silver and
“ Gold, will bear no more than a plain Ring on that
“ Part.”

The Coining-Engine or Mill.

The ſame Treatiſe.

This Machine is ſo handy, that a ſingle Man may ſtamp twenty-thouſand Planchets in one Day. It was invented by *Caſtaing*, an Engineer, whom *Lewis* XIV. rewarded magnificently; and who began to make it work in all our Mints in the Year 1685.

II. “ Gold, Silver, and Copper-planchets, are all of
“ them coined with a Mill, to which the coining
“ Squares, commonly called Dies, are faſtened; that of
“ the Face under, in a ſquare Box, garniſhed with male
“ and female Screws, to fix and keep it ſteady, and the
“ other above, in a little Box, garniſhed with the ſame
“ Screws, to faſten the coining Square. The Planchet
“ is laid flat on the Square of the Effigy, which is dormant;
“ and they immediately pull the Bar of the Mill
“ by its Cords, which cauſes the Screw ſet within it to
“ turn. This enters into the female Screw, which is in
“ the Body of the Mill, ſo that the Bar cauſes the Screw
“ to turn with ſo much Strength, that by puſhing the
“ upper Square upon that of the Effigy, the Planchet,
“ violently preſſed between both Squares, receives the
“ Impreſſions of both at one Pull, and in the Twinkling
“ of an Eye. The Planchet, thus ſtampt, and
“ coined, is called, in *French*, *Denier de monoyage*. It
“ goes through a final Examination made by the *Juge-*

"*gardes* (Mint-wardens) from whoſe Hands it goes into "the World."

The CLOCK.

We have kept the Clock for the laſt of the Inſtruments, which ſerve to inſtruct Man. The Clock does much Honour to the human Mind, both on Account of its vaſt Utility, and its ingenious Structure. The coarſeſt and the moſt antique Clock, were it even the old Balance Clock, with a Ringing as diſmal as that of the *Samaritaine* *, yet never ceaſes, from the Belfrey which contains it, to ſpeak to a whole People, and at equal Diſtances to repeat the Warning that it is appointed to give. It watches, and, from the Beginning to the End of the Night, informs every private Man in the Intervals of his Sleep. It is the Clock that gives the firſt Signal of Prayers, that cauſes the Gates of Towns to be opened, that calls Aſſemblies together, and publiſhes all our Works as they ſucceed one another. It is the Rule of Society.

WHEEL-CLOCKS.

See the Treatiſes on the Clock-Works of Meſſieur Huggins, Derham, Sully, and Thiouſt.

Wheel-clocks are Machines compoſed of a Variety of Pieces, concurring all of them, by the Equality of their Motions, to the dividing of Time into equal Parts. The Principle of Motion in Clocks, is either a Weight or a Spring that cauſes the Wheels to turn; and it is a Pendulum, or a Balance with a ſpiral Spring, that moderates this Motion, and renders it either equal or uniform.

Clocks ſtrike, or ſtrike not, To make a Clock ſtrike, you muſt increaſe the Number of the Wheels and Springs, and add to it other Pieces, which vary much, according to the peculiar Genius and Fancy of each Maker.

They call *Movement* in a Clock, the Aſſemblage of the Pieces which make the Hands of the Dial to turn, or the Clock to ſtrike. When a Clock ſtrikes the Hours at the ſame Time that it points them out; they call *firſt Movement*, all the Parts that ſet the Hands a going, and *ſecond Movement*, thoſe that procure the Ringing.

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* A public Clock on the Pont Neuf, at Paris.

The eſſential Property of a good Clock is the Regularity of its Motion. If it goes ſometimes faſt, ſometimes ſlow, it cannot be made the Meaſure of Time. In order, then, that a Clock may anſwer the End it is intended for, it muſt, firſt, be regular, that is, it muſt be wrought according to the Rules of Art; and, ſecondly, it muſt be ſettled and kept in that Equality of Motion, which conſtitutes its Goodneſs. We ſhall, for the future, ſuppoſe that the Pieces of a Clock are without Defects, and that nothing on their Part alters the Equality of Motion.

The Common Pendulum Clock.

The Principle of the Motion of a common Pendulum Clock is a Spring. The Spring is a ſteel Lamina well beaten, which rolls over itſelf, and makes ſeveral Turns of a ſpiral Form. The more Turns you cauſe it to make, the ſtiffer it grows, and the more it ſtrives to unfold. In order thus to turn the Spring into a Spiral and bend it, they incloſe it in a hollow Cylinder, called the Barrel A, which is traverſed by an Arbor, that ſerves as an Axis to it. The Spring is faſtened at one of its Extremities to the Arbor which is fixed, and is faſtened at the other Extremity to the inward Circumferences of the Barrel, ſo that the Barrel turning, whilſt the Arbor remains ſteady, the Spring muſt neceſſarily roll itſelf over the Arbor, and, when the Barrel turns the oppoſite Way, then the Spring unfolds itſelf of courſe.

When the Spring is wound up, it endeavours of its own Accord to be reſtored, ſo that, by drawing the Circumference of the Barrel, it alſo draws whatever is faſtened to it. It acts upon the Wheel-work, conſiſting of five Wheels, not reckoning thoſe which are between the Dial and the Plate it is faſtened to. The Wheel A is upon the Barrel, and has eighty-four Teeth: It takes into the Teeth of the Pinion of the Wheel B, which is called the third Wheel. This Pinion has fourteen Teeth or Leaves, and the Wheel B has eighty-four, as well as the Wheel A. The Wheel B takes into the Leaves of the Pinion of the Wheel C, which is called the long-arbored Wheel, becauſe the Arbor of that Wheel traverſes the Dial: It is alſo called the Minute-wheel, becauſe the ſaid Arbor carries the Minute-hand. The Pinion has ſeven Teeth, and the Wheel itſelf has ſeventy eight. The Minute wheel C takes into the Leaves of the Pinion of the Wheel D, called the Cantrat or Canting-wheel. The Pinion of this has ſix Leaves, and the Wheel itſelf has ſixty-ſix. The Wheel D takes into the Leaves of the Pinion of the Balance-wheel E. The Pinion of this Wheel has ſix Leaves, and the Wheel itſelf has thirty-three Teeth.

The Spring would unbend with Precipitation, and cauſe the Wheel-work and the Hands of the Dial to turn with the utmoſt Swiftneſs, if nothing moderated the Quickneſs of this Action. But, they regulate the Strength of the Spring in the Barrel, by Means of a Weight which is ſuſpended, and ſwings from Right to the Left, and from Left to Right. This Weight is faſtened to a Wire, or an Iron-rod of a certain Length. This Aſſemblage of the Weight and the Rod is called the Pendulum: The Rod is faſtened, at its upper End, to an horizontal Arbor that moves round its Pivots: This Arbor has two Pallets, which the Teeth of the Balance-wheel ſtrikes againſt. They are diſtant from each other the Diameter of the Balance-wheel ** and their Planes or flat Surfaces make an Angle of about an hundred Degrees. When one of the two Pallets is ſtruck, the other is free. Now, as the Weight that ſwings cannot vibrate backwards and forwards, but in a certain Time, the Balance-wheel is alternately ſtopt by one and the other Pallet, and is ſtopt the longer, as the Pendulum is ſlower, and its Vibrations of longer Duration. It is plain, that, at each Vibration, the Balance-wheel ſtrikes againſt one of the Pallets, and it is always the oppoſite Teeth that are in this alternate Contact: Therefore the Quickneſs of the Motion of the Wheel-work depends on the Quickneſs or Slowneſs of the Vibrations of the Pendulum. Now the Spring in the Barrel cannot unfold, but in Proportion as the Wheel-work yields to its Impreſſion; therefore the Pendulum, by retarding the Wheel-work, moderates the Strength of the Spring. The alternate Meeting of the Pallets of the Arbor of the Pendulum, with the Teeth of the Balance-wheel, is called the Scapement. The Goodneſs of the Scapement is an eſſential Part of the Clock. Its Perfection conſiſts in not diſturbing the Iſochroniſm or equal Duration of the Vibrations of the Pendulum: For, the Pendulum makes, of its own Accord, all its Vibrations in equal Times: But, the Scapement may, by the Inequality of its Shocks, alter the Equality of the Vibrations; and the Maſters in the Art, who know how much a good Scapement contributes to the Regularity of a Clock, make it their ſpecial Care to find out the Defects of the old Scapements, in order to mend them, or even to invent new and more perfect ones. Great Commendations are beſtowed on that found by Mr. *Gourdain*, one of our moſt ingenious Clock-makers; who has adapted it with equal Succeſs to the common Watch.

The Wheels, we have juſt mentioned, are deſigned to regulate the Unfolding of the Spring in the Barrel; and the Number of their Teeth muſt anſwer the Number of the Vibrations of the Pendulum. But there are other Wheels, which are concealed between the Dial and the Plate of Metal to which it is faſtened, and ſerve for the Motion of the Hands: The Aſſemblage of them is called the Motion-part.

To underſtand this Diſpoſition of the Wheels, and to be ſenſible of their Effect, we muſt recall what we ſaid a little before, that the Arbor of the Minute-wheel comes through the Dial at its Center. This Arbor enters with a Friction into a Pipe called the Canon-pinion. The Minute-hand, which is the outermoſt, is fixed upon this Pinion. It carries alſo a Pinion, which takes into the Wheel F, called the Wheel of Communication. This Wheel has a Pinion of ſix Leaves, which takes into the Dial-wheel G, having ſeventy-two Teeth. This Wheel is bored at the Center, and traverſed by the Arbor of the

Minute-wheel, and by the Canon-pinion. This Dial-wheel is ſurmounted by a ſmall Pipe, which makes but one Body with it, and carries the Hour-hand G.

What we have juſt ſaid is ſufficient to ſhew why we may turn the Hour and the Minute-hand both to the Right and the Left, without altering any thing in the Motion of the Pendulum. For the Canon-pin ſticking to the Arbor of the Minute-wheel, no otherwiſe than by Friction, it thence follows, that, if nothing overpowers the Friction, this Canon will turn along with the Minute-wheel: But, if ſome Cauſe ſhould overpower the Friction, in that Caſe the Canon will turn which Way you pleaſe without the Minute-wheel, and, the Hand of the Minutes being upon this Canon, it will conſequently turn with it. Beſides, as the Pinion of the ſaid Canon takes into the Teeth of the Wheel F, and the Pinion of that Wheel into the Dial-Wheel G, to the ſmall Pipe of which the Minute-hand is joined; of courſe, the Hand of the Minutes happening to turn without the Minute-wheel, the Hour-hand will turn along with it. Therefore, if the Pendulum be either too faſt or too ſlow, you may equally put backward or forward the Hands of the Dial, to adjuſt them to the Hour.

Let us now ſee, in what Manner the Wheels, with the Number of Teeth we have reſpectively aſſigned them, cauſe the Hand of the Minutes to make a whole Turn of the Dial in an Hour, whilſt the Hour-hand makes only that ſingle Turn in twelve Hours Time. We are then to obſerve, that, if the Number of the Teeth of a Wheel is divided by the Number of the Leaves of the Pinion which it takes into, the Quotient will mark the Number of Turns which the Pinion makes, whilſt the Wheel makes one. For Inſtance: The Minute-wheel C has, as we ſaid, 78 Teeth, and it takes into a Pinion of 6 Leaves belonging to the Canting-wheel: Now 6 is contained 13 Times in 78: Therefore the Pinion of the Canting-wheel, and of courſe that Wheel itſelf, makes 13 Turns, whilſt the Minute-wheel makes but one. Likewiſe the Canting-wheel D has 66 Teeth, and it takes into a Pinion of 6 Leaves belonging to the Balance-wheel E; therefore, dividing 66 by 6, the Quotient 11 is the Number of Turns which the Balance-wheel and its Pinions make, whilſt the Canting-wheel makes but one. The Balance-wheel E has 33 Teeth, every one of which is, in each Turn it makes, met by one of the Pallets of the two Pallets of the Arbor of the Pendulum: Therefore, in one ſingle Turn of the Balance-wheel, the Arbor of the Pendulum ſtrikes 66 Times againſt the Teeth of that Wheel: Now, each Time one of the Pallets ſtrikes the Balance-wheel, the Pendulum makes one Vibration; therefore the Pendulum makes 66 Vibrations in one Turn of the Balance-wheel. Let us recapitulate. The Minute-wheel makes one Turn, whilſt the Canting-wheel makes 13; and the Balance-wheel makes 11, whilſt the Canting-wheel makes one: Therefore the Balance-wheel makes 13 Times 11, that is 143 Turns, whilſt the Minute-wheel makes but one: But the Pendulum oſcillates 66 Times, whilſt the Balance-wheel makes one Turn; therefore, the Pendulum makes 143 Times 66 or 9438 Vibrations, whilſt the Balance-wheel makes 143 Turns. Now, the Minute-wheel ought to make its Revolution in an Hour, ſince the Arbor of that Wheel carries the Minute-hand, which ought to make the Compaſs of the Dial in an Hour: Therefore the Pendulum ought to make 9438 Vibrations in the like Space of an Hour: Now, the Pendulum muſt be 64 Lines, that is, 5 Inches and 4 Lines long, to make this Number of Vibrations in an Hour. Were it longer, it would make fewer in the like Time, and the Numbers propoſed would no longer ſuit ſuch a Pendulum. The ſame Thing would happen, if it was ſhorter, as it would make more than 9438 Vibrations in an Hour. You ſee then, that, the Numbers of Teeth given to the Minute, Balance, and Canting-wheels, being ſo determined, as that the Minute-wheel may make its Revolution in an Hour, a Pendulum of a certain Length is of courſe required. With a Pendulum of 5 Inches 4 Lines $\frac{1}{5}$, the Minute wheel, the Hand it bears, and the Canon pinion, ſhall then make one Turn in an Hour: The Wheel of Communication F will alſo make its Revolution in the like Time, it having as many Teeth as the Canon-pinion: Now, the Dial-wheel G, which carries the Hour-hand, has 72 Teeth: If then you divide this Number by the Pinion 6 of the Wheel of Communication, the Quotient 12 is the Number of

Turns which the Wheel will make, whilſt the Dial-wheel makes one; therefore the Wheel of Communication and the Minute-wheel ſhall make 12 Turns, whilſt the Dial-wheel makes one: It will then go round the Dial in 12 Hours, ſince the Minute-wheel makes it in one.

The two firſt Wheels A and B will exactly determine the Time the Pendulum will go without being wound up. The third Wheel B has 84 Teeth, and it takes into a Pinion of Seven, which is faſtened to the Minute-wheel C. If, then, you divide 84 by 7, the Quotient 12 is the Number of Turns which the Pinion 7 and the Minute-wheel C make, whilſt the third Wheel B makes one: Now the Minute-wheel C makes 24 Turns in one Day, therefore the Wheel B makes two Turns in the like Time. On the other Hand, they give the Wheel A 84 Teeth, and it takes into a Pinion of 14, belonging to the Wheel B: If, then, you divide 84 by 14, the Quotient 6 is the Number of Turns which the Pinion 14 and the Wheel B make, whilſt the Wheel A makes one. Now, the Wheel B makes two Turns in one Day, therefore it makes 6 Turns in three Days: And as the Wheel A makes one Turn, whilſt the Wheel B makes 6, it follows, that the Wheel A makes one Turn in three Days; therefore the Spring in the Barrel makes alſo one Turn in the ſame Time, and one of the Spires unfold itſelf in that Space. If then, the Spring makes five Turns in bending round itſelf, and round an Arbor of the Barrel, the Pendulum will go fifteen Days without being wound up. But as the Spring would not be ſtrong enough toward the End, if it were entirely unfolded, Uſe has taught the Clock-makers to make it of eight Spires and a half inſtead of five.

The FUSEE.

* The Fuſee has the Figure of a truncated Cone, or rather of a Bell: It is a perpetual Lever which corrects the Inequality of the Action of the Spring in the Barrel, in ſuch Manner that the Action of the Spring, which

is of itſelf unequal, may nevertheleſs become equal when it exerts it upon the Wheel-work. It is for that Reaſon that the Fuſee is unequally big as it riſes. When the Spring is bent, the Fuſee begins to be covered with the Chain at its loweſt End, and when the Chain is come to the higheſt Part of the Fuſee, the Spring is bent in the Barrel, as much as it can poſſible be. The Tenſion of the Spring being now the greateſt and the moſt powerful it can acquire and exert upon the Wheel-work, it is diminiſhed by making it draw the Fuſee, and conſequently the Wheel-work, by the Part of the Chain that lies upon the narroweſt of the Spires. It then draws by the ſhorteſt Lever. The Action of this Spring weakening ſucceſſively more and more, it acts and pulls by a Lever, which is gradually and ſucceſſively longer and longer. Therefore the ſucceſſive Loſs of the Forces of the Spring is proportionably repaired by the Advantage of the ſucceſſive Lengthening of the Lever.

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* Fig. IV. F.

† The following is a Method for cutting the Spires of the Fuſee. You muſt ſtop and fix the Arbor A B, that the Barrel C C turning round that Arbor, the Spring may bend as it folds round itſelf within the Barrel: In order to this, you muſt ſurround the Barrel with a Silk-ſtring, thin and long enough to cover the Fuſee, and faſten at one End of it the Weight D, which is four Ounces, and will make the Barrel run round the Arbor A B, and the String will lengthen as it unfolds itſelf. This done, you muſt place a Thread F E horizontally or parallel to the Arbor A B, and mark upon it the Point G, at which the Weight D meets it when it ſtops: Then, you muſt add Ounce-weights ſucceſſively, and, at each Addition of a new Weight, you muſt ſtay till the Barrel ceaſes turning, and then mark upon the ſilk String the Point at which it meets the horizontal Thread; in this Manner you will have upon the String as many Diviſions as you have added Ounce-weights to the firſt Weight D: If you continue this Operation till the String is long enough to cover the Fuſee, you will have what is neceſſary to draw it out. I. You are to find the Lengths of Lever which anſwer to the different Weights which

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† Fig. III.

have given the ſeveral Lengthenings of the String, or produced the ſucceſſive Tenſions of the Spring. *If, for Inſtance, you are deſired to find out the Length of the Arm G H, when the Spring pulls with an Effort of ſix Ounces, that is, when the Barrel ſupports a ſix Ounce-weight; the Semi-diameter A C of its Baſis being ſuppoſed to contain 24 Parts, you muſt make the following Proportion: As ſix Ounces are to four Ounces, ſo is B C of 24 Parts to G H of 16 Parts. You will find the other Arms by as many ſuch Proportions as you have marked Diviſions upon the String. II. To place upon the Fuſee the different Lengths of Lever, which you have determined in the Manner juſt mentioned, you muſt cut out the Fuſee ſmaller and ſmaller from the Bottom to the Top, ſo that the firſt Diviſion of the String may be between B C and the Lever, which anſwers the Weight of five Ounces; and the ſecond Diviſion of the ſaid String between the Lever, which anſwers the Weight of five Ounces, and the Lever G H, which anſwers the Weight of ſix Ounces; and ſo on, till the laſt Diviſion of the String be between the laſt Lever but one and the laſt, which is the ſhorteſt of all, and muſt terminate the upper End of the Fuſee.

An Idea of a common WATCH.

Our common Watches point out the Minutes, and, if you pleaſe, the Seconds. They have five Wheels, excluſive of thoſe of the Motion, a Barrel which contains the Spring, or Primum Mobile, a Fuſee, a Balance, the Spiral-ſpring, and an endleſs Screw, which ſerves to ſlacken or bend it more. The main Spring in the Barrel acts upon the Fuſee, by means of a Chain which is wound ſometimes round the Barrel, ſometimes round the Fuſee, or partly round the one, and partly round the other.

‡ The firſt of the five Wheels A is the Wheel of the Fuſee. It has the ſame Axis or Arbor as the Fuſee; in ſuch Manner, however, that the Fuſee may turn without the Wheel, and the Wheel can never turn without the Fuſee. The Fuſee turns without the

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* Fig. IV. ‡ Fig. V.

Wheel, when the Spring in the Barrel is wound up; for you make both the Fuſee and Barrel turn by means of the Key: For which Reaſon the Chain does then paſs from the Surface of the Barrel to that of the Fuſee. It is only this Way that the Fuſee can turn without the Wheel A, the Plan of which is ſeen in a. When the Spring is wound up, and the Key taken out, the Baſis of the Fuſee, which is cut into crooked Teeth H, and is buried in the Thickneſs of the Wheel of the Fuſee A, meets a ſmall Piece of Braſs, moveable round a fixed Point I, which permits the Teeth to ſlide away whilſt the Watch is wound up, and ſtops them when you offer to turn the Fuſee the oppoſite Way. Then the Fuſee and its Wheel yield together to the Chain as making but one and the ſame Body: And as the Spring in the Barrel acts by means of the Chain upon the Fuſee, and conſequently upon its Wheel, the whole Wheel-work is pulled, and the Motion is communicated to the very Wheels of the Dial. The ſecond Wheel B is called the Minute-wheel, and alſo the long arbored Wheel, becauſe its Arbor comes through the Dial. The Wheel C is called the third Wheel. The Wheel D is called the Canting wheel; and the Wheel E the Balance-wheel. All theſe Wheels have a Pinion, except the Wheel A of the Fuſee. Theſe five Wheels are viſible on opening the Watch; but there are ſome which lie concealed between the Dial and the firſt Plate. They are for the Hands of the Dial; and are, for that Reaſon, called the Motion: This Motion-work conſiſts of two Pinions and two Wheels. The firſt of theſe Pinions is upon a Pipe or Canon, into which the Arbor of the long ſhanked Wheel enters with Friction, ſo that the Canon may turn to the Right and Left, without the Wheel belonging to the Arbor on which it is put, when you make an Effort capable of overpowering the Friction. It is called the Canon-pinion, as was already ſaid. This Pinion takes into the Teeth of the Wheel of Communication F, whoſe Pinion takes into the Dial-wheel G, which is upon a Canon, into which the Arbor of the Minute-wheel, and the Canon pinion enter without Friction. This Canon carries the Minute-hand, which conſequently makes a Turn of the Dial in the ſame Time as the Minute-wheel does: And the Canon of the Dial-wheel G carries the Hour-hand, which makes likewiſe its Revolution in the ſame Time as the Wheel does. This* is only the Unfolding of the Pieces, many of which would lie hidden if they were put to the Perſpective of the Aſſemblage.

The Number of Teeth commonly given to the Wheels and Pinions of a Watch are as follow: The Wheel of the Fuſee A has 48 Teeth; the Minute-wheel B 54, and a Pinion of 12. The third Wheel C 48, and a Pinion of 6; the Canting-wheel D 48, and a Pinion of 6. The Balance-wheel E 15, and a Pinion of 6. The ſame Motion might be effected, and the Hands of the Dial be made to turn, that is, the Hand of the Minutes in an Hour, and the Hand of the Hours in 12, by means of Numbers different from theſe. Let us, however, be contented with the uſual Calculations.

If you divide the Number 48 of the Wheel A, by the Number 12 of the Pinion of the Wheel B, the Quotient 4 is the Number of Turns which the Wheel B and its Pinion make, whilſt the Wheel A make one. If you divide the Number 54 of the Wheel B, by the Number 6 of the Pinion of the Wheel C, the Quotient 9 is the Number of Turns of the Wheel C and its Pinion, whilſt the Wheel B makes one. If you divide the Number 48 of the Wheel C by the Number 6 of the Pinion of the Wheel D, the Quotient 8 is the Number of Turns of this Wheel and its Pinion, whilſt the Wheel C makes one Turn. Finally, if you divide the Number 48 of the Wheel D, by the Number 6 of the Pinion of the Balance-wheel E, the Quotient 8 is the Number of Turns of the Wheel E and its Pinion, whilſt the Wheel D makes one.

Let us now ſee the Number of Turns which the Balance-wheel makes, whilſt the Minute-wheel B makes one. The Wheel C makes 9 Turns, whilſt the Wheel B makes one, and the Wheel D makes 8, whilſt the Wheel C makes one. Therefore the Wheel D makes 9 Times 8, or 72 Turns, whilſt the Wheel C makes 9. But the Wheel E makes 8 Turns whilſt the Wheel D makes one; therefore, the Wheel E makes 8 Times 72, or 576 Turns, whilſt the Wheel D makes 72: Conſequently, the Wheel E makes 576 Turns, whilſt the Wheel B makes one, or whilſt the Wheel C makes 9, and the Wheel D 72: But the Wheel B makes one Turn in an Hour, becauſe its Arbor bears the Minute-hand; therefore, the Wheel E makes 576 Turns in the like Time of an Hour: Now, the Pallets of the Balance K ſtrike, each of them, againſt all the Teeth of the Balance wheel E, at each Turn of the ſaid Wheel; and it having 15 Teeth, the two Pallets together muſt, of courſe, ſtrike the Teeth of the Balance-wheel 30 Times in one Turn of the ſaid Wheel: And the Balance making one Vibration, at each Time the Wheel of the Pallets hits againſt one Tooth of the Balance-wheel, the Balance makes, of courſe, 30 Vibrations in one Turn of the Balance wheel, and 576 Times 30, or 17280 Vibrations, in 576 Turns, or in an Hour; which is, of courſe, the Number of Vibrations made by the Balance in an Hour.

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* Fig. V.

The Balance muſt then be neither too heavy nor too light, but of that critical Weight that will agree with this Number of Vibrations. If it is too heavy, the Vibrations will be ſlow, and it will make leſs than 17280 in an Hour's Time, and the Watch will be too ſlow. If, on the contrary, it is too light, it will make a greater Number of Vibrations during the ſame Time, and the Watch will be too faſt.

Since the Minute hand makes one Turn in an Hour, on the Suppoſition that the Balance makes 17280 Vibrations in the ſame Time, it follows likewiſe, that the Canon-pinion makes its Revolution alſo in an Hour. Now, this Pinion has 12 Teeth, and the Wheel of Communication 36; therefore, if you divide 36 by 12, the Quotient 3 is the Number of Turns of the Pinion, during one Turn of the Wheel of Communication F. The Dial-wheel G has 40 Teeth, and the Pinion of the Wheel of Communication has 10; if then you divide 40 by 10, the Quotient 4 is the Number of Turns of the Wheel of Communication F, during one Turn of the Dial-wheel G: But, whilſt the Wheel F makes 4 Turns, the Canon-pinion and the Minute-hand make 4

Times 3, or 12 Turns: Therefore the Minute-hand makes 12 Turns, whilſt the Dial-wheel G and the Hand of the Hours make one Turn; and, as the Hand of the Minutes turns round the Dial in an Hour, it follows, that the Hand of the Hours muſt turn in 12.

The Minute-wheel B makes 4 Turns, whilſt the Wheel of the Fuſee A makes one: Therefore, one Turn of the Chain unwinds itſelf from the Fuſee, and thence paſſes over the Barrel in the Space of 4 Hours. Therefore, if the Chain makes 8 Turns round the Fuſee, the Watch may go 32 Hours: If it makes more or leſs Turns, it will go more or leſs than 32 Hours. But, the Spring being too weak when it comes near the End of the Fuſee, no body waits till the Chain is quite off the Fuſee before he winds up his Watch: But they wind it up every 24 Hours, and rather getting up than going to Bed; becauſe, if you forget it at Night, you run the Riſk of paſſing the whole Night without thinking of your Watch.

* In order to render the Vibrations of the Balance of a more equal Duration, they add to it a Spiral-ſpring. This is a very narrow and very thin Steel-lamina L, wound into a ſpiral Line, and faſtened by one of its Extremities M to the Arbor of the Balance, which traverſes the ſaid Line perpendicularly, and to a fixed Point N, by the other Extremity. There is a Portion of a Wheel OO called the Ratch, which is made to turn at pleaſure to the Right or Left, according as you turn the Hand P of the Silver-piece, which is near the Cock R, and which moves the ſmall Wheel S, whoſe Teeth take into thoſe of the Ratch. Now the Spiral-ſpring paſſes through a Ring or Slide X which is faſtened to the Ratch, and is governed by it. If then the Slide, which fixes the Spiral at the Point X, brings this Point into L towards N, where the Spiral-ſpring is faſtened by one of its Extremities, the Vibrations are leſs frequent, becauſe this Spring becomes by that means longer, and the Motion of the Hands, and of the whole Watch is ſlackened: If, on the contrary, the Slide goes from the fixed Point, the Spiral-ſpring is thereby ſhortened, its Vibrations are more frequent, and the Watch is faſter.

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* *Fig.* VI.

To make the Watch go faſter or ſlower, by turning the Hand of the Silver-piece P, which covers the little Wheel S, you muſt know, that on one ſide of the *Roman* Figure XII. there are the Figures, I. II. III. IIII. V. &c. And the Figures, XI. X. IX. VIII. VII. &c. Let us ſuppoſe the Hand to be upon the Number XII. If you have a Mind to have the Watch go faſter, you muſt make the Hand to be upon the Number I. II. III. IIII. &c. If one the Contrary, you would make the Watch go ſlower, you muſt put the Hand upon one of the Numbers on the other Side. To be able to govern and rule a Pendulum that points to the Seconds, it will ſuffice to ſee the Enumerations of the Pieces of *Fig.* VII. *Plate* XXXIII.

PLATE XXXI.

COINS.

Fig. A. The Machine to write on the Edge of Coins.
Fig. B. The Mill.

PLATE XXXII.

CLOCK-MAKING.

Fig. I. The Wheel-Clock ſeen ſide-ways.

Fig. II. The Wheel-Work, and the Motion ſeen in Front.

Fig. III. IV. and V. The Management of the Fuſee.

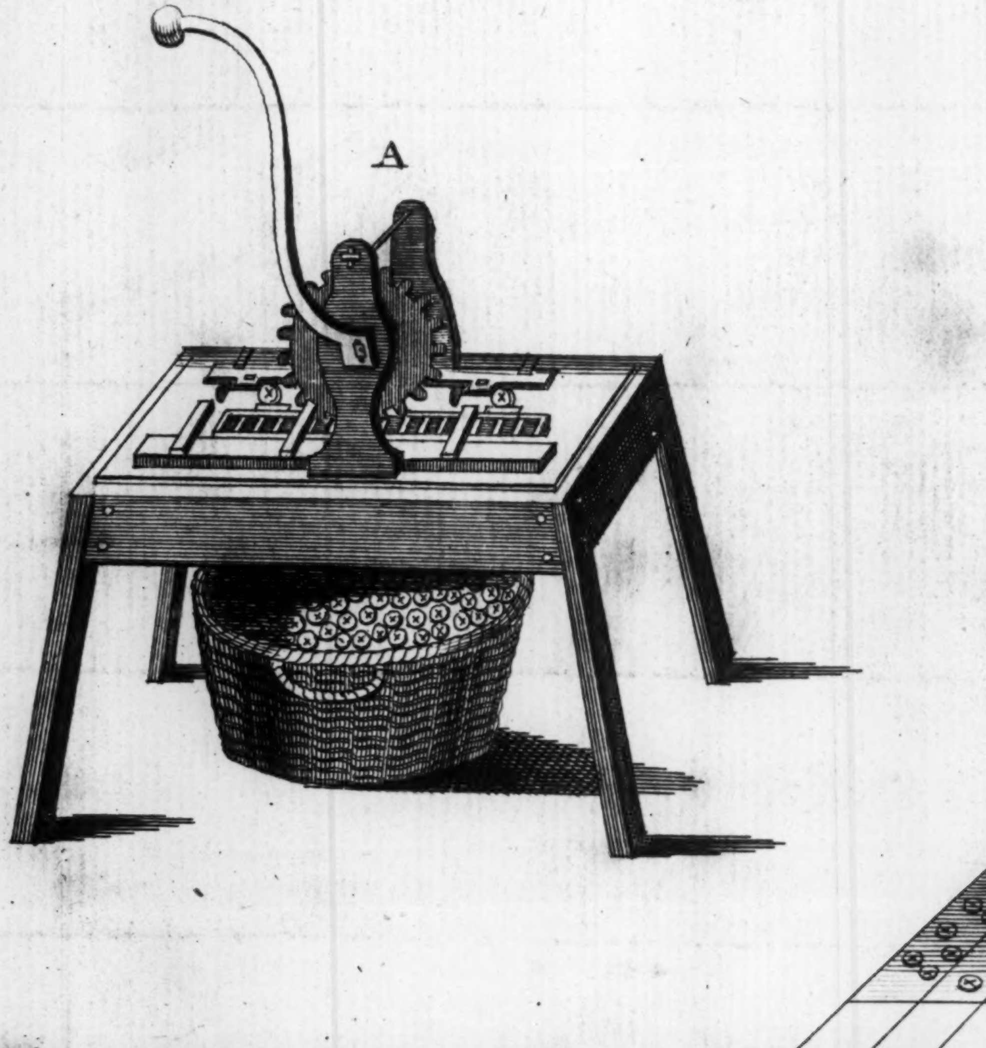
PLATE XXXIII.

The WATCH *and the ſecond* PENDULUM.

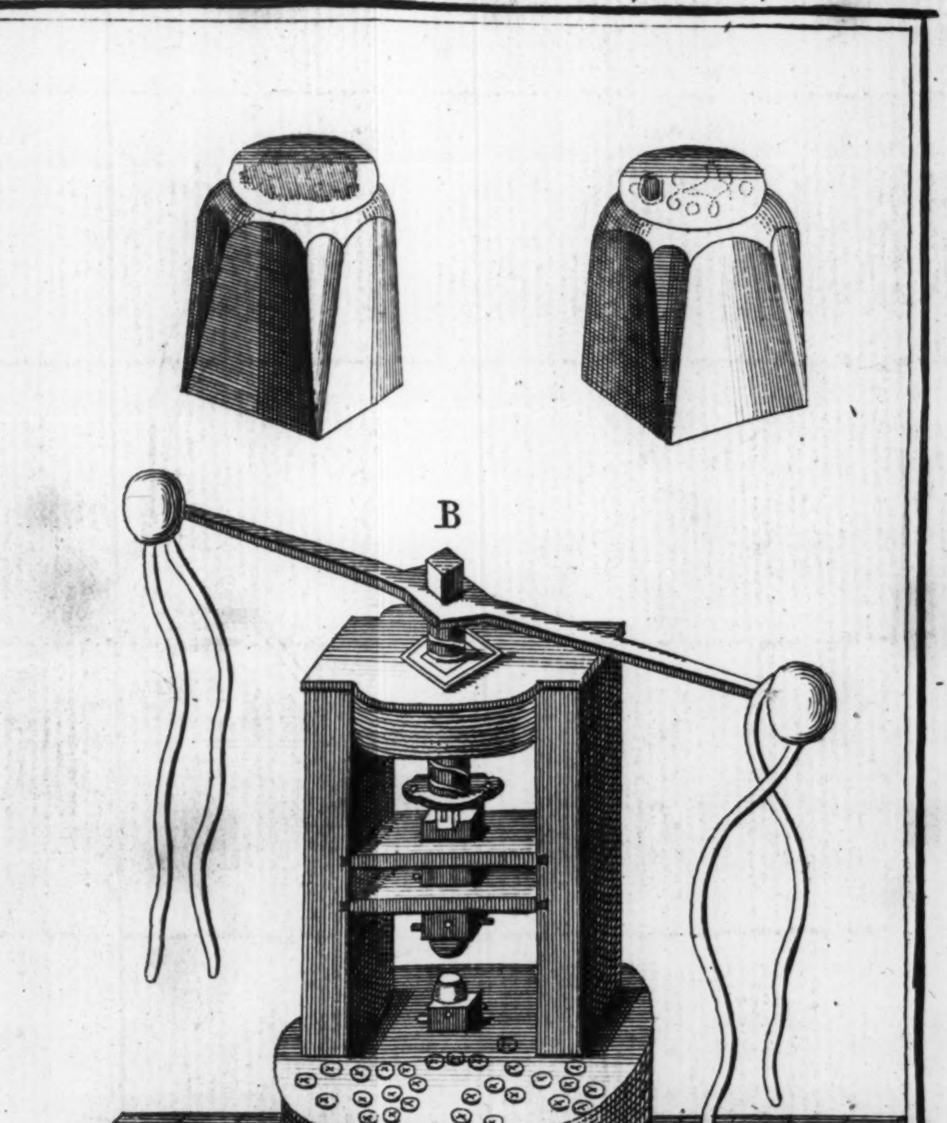
Fig. V. the Watch.

A. The Barrel, the Chain, and the Fuſee with its Wheel.

a. A Plan of the Wheel, which the Fuſee draws along with itſelf.

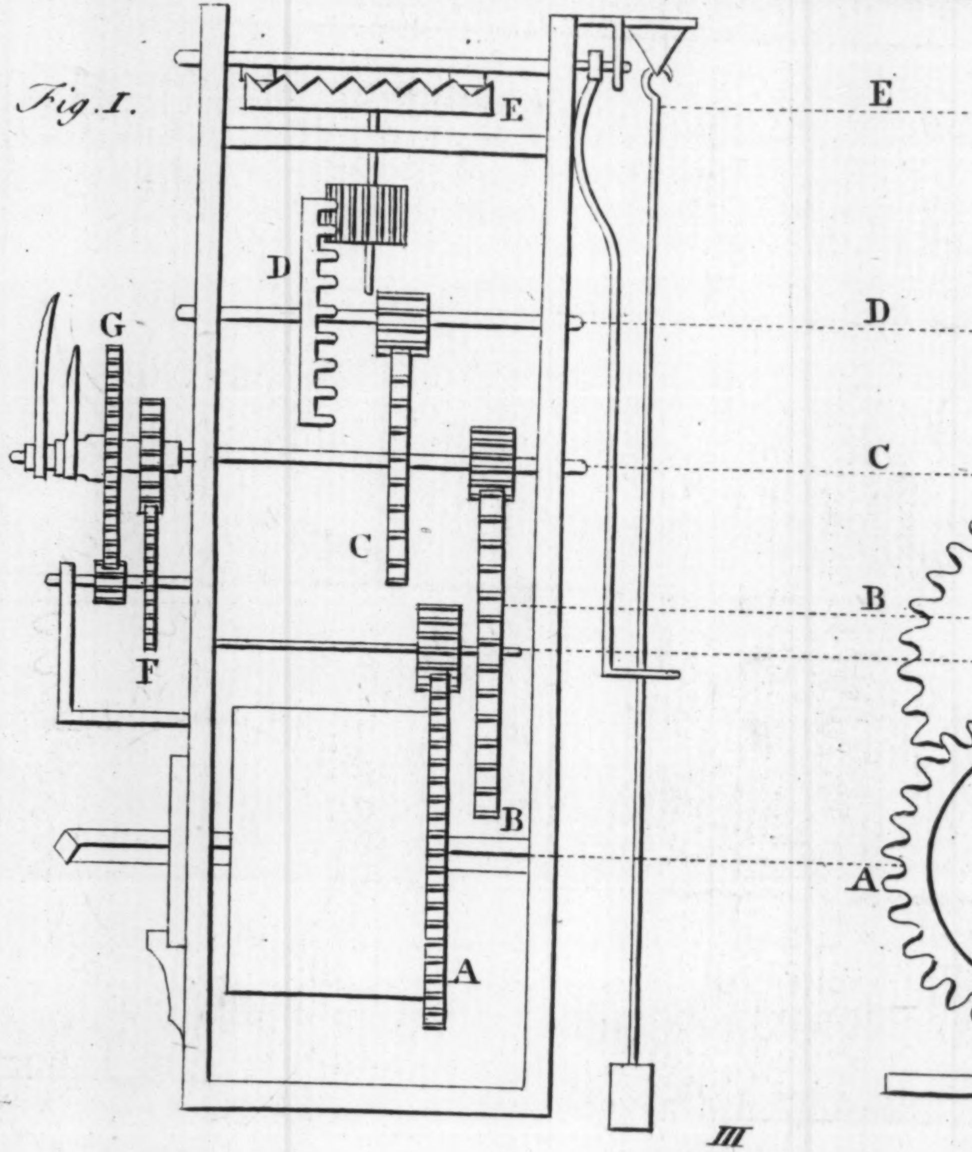


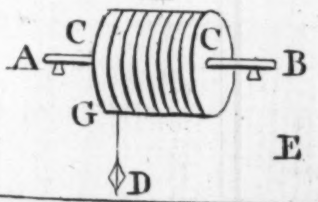
Machines for Co



r Coining.

Fig. I.





Clock-making

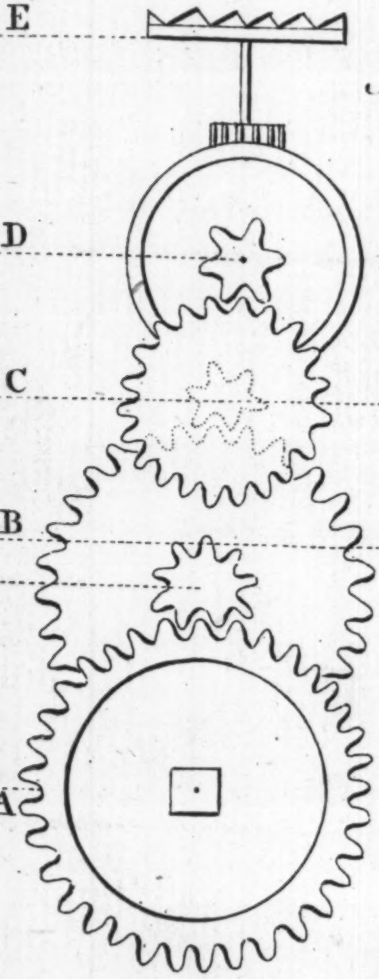
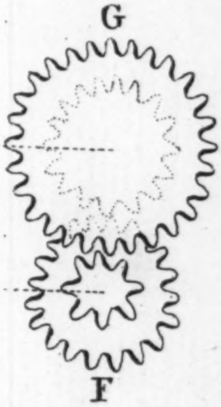
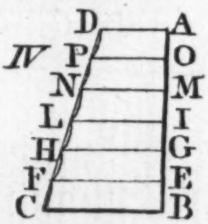


Fig. II.



IV



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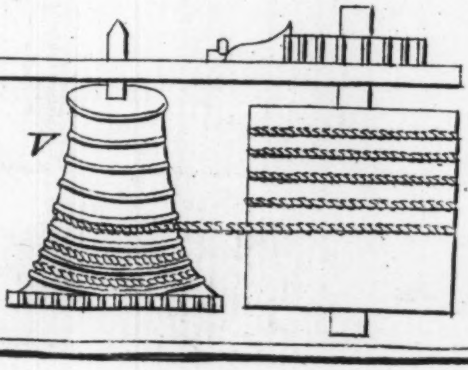
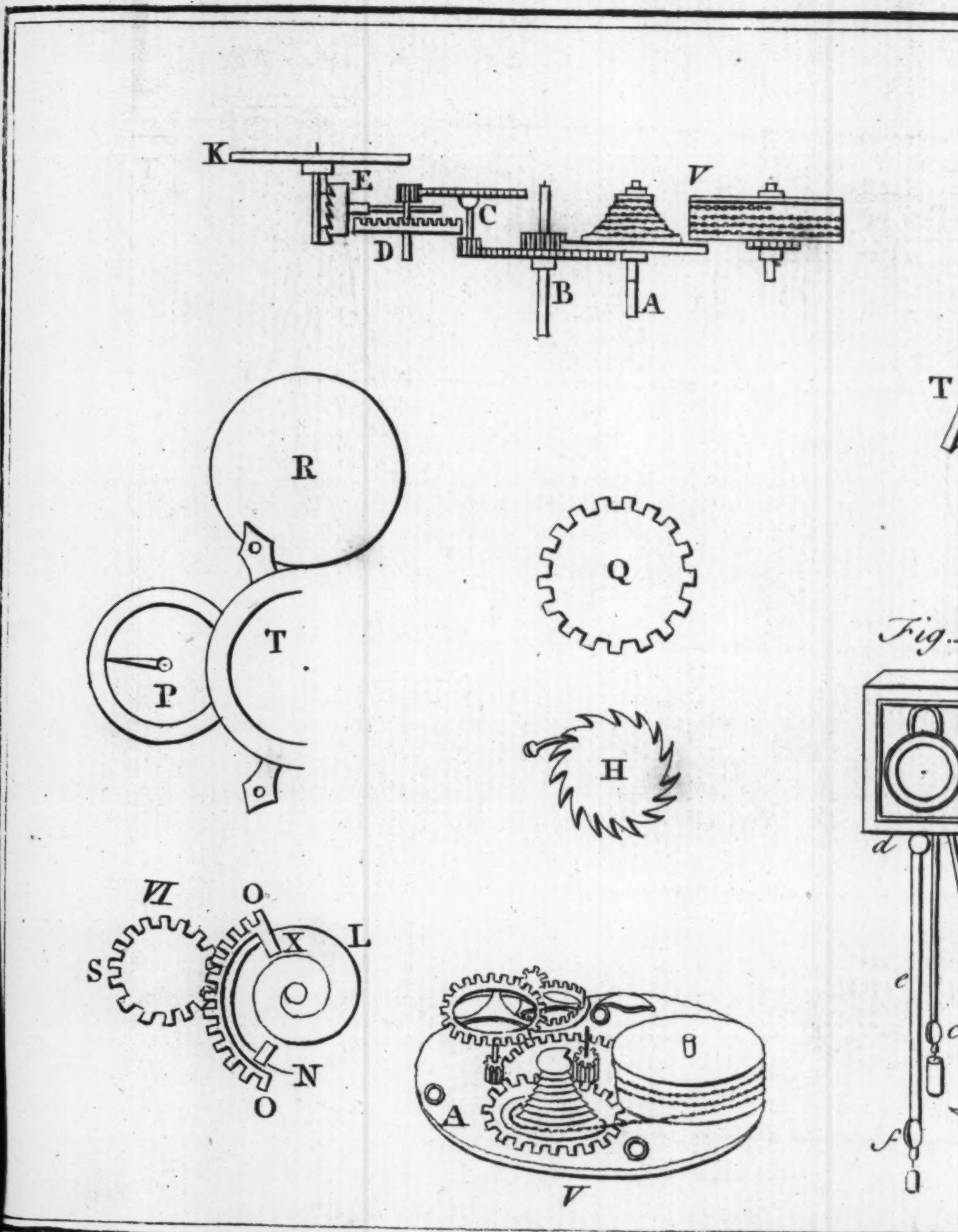


king.



The Watch and Second P

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Fig. VIII.

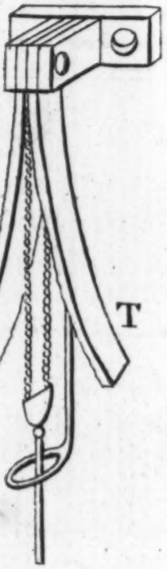
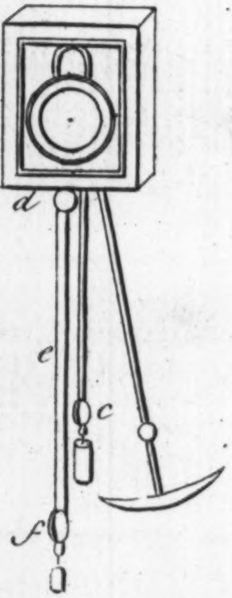


Fig. IX.



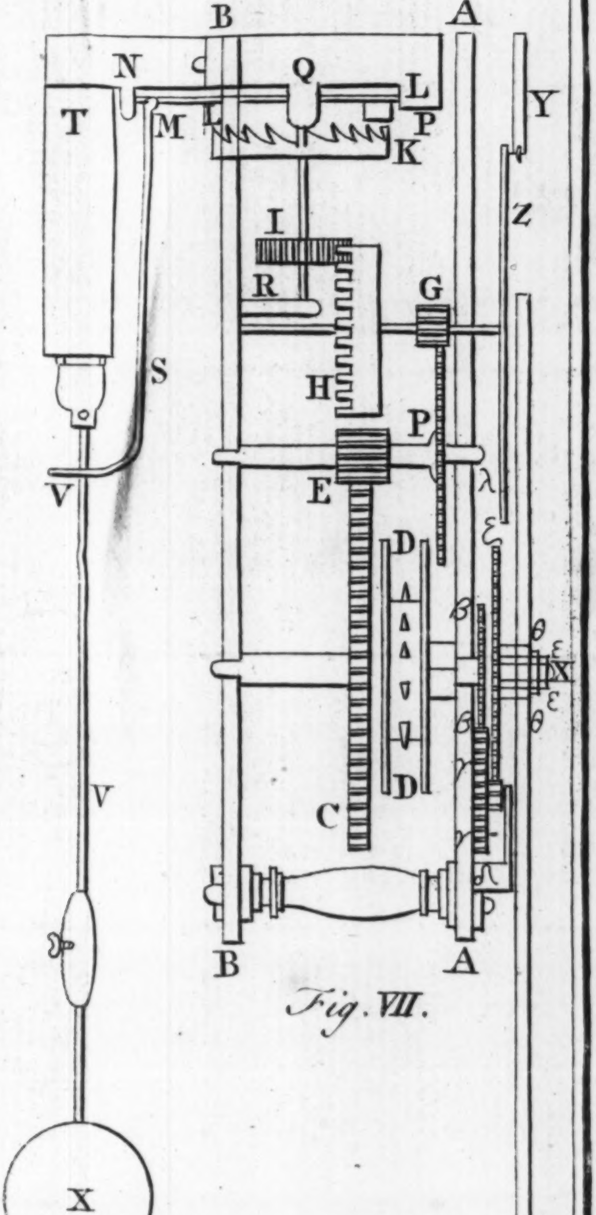


Fig. VII.

d Pendulum.

B. The Minute-wheel.

C. The Third-Wheel.

D. The Canting-wheel.

E. The Balance-wheel moving alternately the Pallets of the Balance K.

F and G are here as they are in the Motion of the Pendulum, Plate XXXII.

F. The wheel of Communication, which is drawn by the Pinion of the Canon laid over the Shank of the Minute-wheel B.

G. The Dial-wheel, which is, together with its Hand, drawn by the Pinion of the Wheel of Communication F.

H. The under Part of the Fuſee turning freely one Way, and ſtopt the other Way by the Click I, which keeps the Fuſee united the ſame Way with the Wheel A a, ſo that the Fuſee, which is pulled by the Spring, leads alſo the ſame Way both the Wheel A and the Wheel-work.

K. The Balance and its Pallets **.

L. The Spiral-ſpring.

M. One End of the Spiral-Line, ſaſtened to the Shank of the Balançe.

N. The other End faſtened to a thick Point.

OO. The Ratch.

P. A Silver-piece which hides the Wheel S, and draws the Ratch by means of it.

R The Cock, which is both the Cover and the Support of the Balance.

T. The Slide.

X. The paſſage of the Slide, which lengthens or ſhortens the Spiral Line, according as it is led by the Balance.

What might be ſtill puzzling in the Aſſemblage of the ſeveral Pieces of a Spring-Pendulum, or a Watch, will be compleatly cleared by what remains to be ſaid of the Pendulum which points out the Seconds.

The PENDULUM *with Weights, and pointing out the Seconds.*

Fig. VIII. AA, BB, the Plates or Pieces of Support.

C. The firſt Wheel which has 80 Teeth, and the Axis of which bears alſo the little Wheel D, briſtling with Points, to hinder the too free ſpinning of the Cord which is over it, and which being pulled by a Weight, cauſes the Wheel C, and the whole Work to move along with it.

E. A Pinion of 8 Teeth, into which the Wheel C takes.

F. The ſecond Wheel, which has 48 Teeth.

G. A Pinion of 8 Teeth, which the ſecond Wheel F takes into.

H. The Canting-wheel, having alſo 48 Teeth.

I. An horizontal Pinion of 24 Teeth.

K. The Balance-wheel having 15 Teeth like thoſe of a Saw.

L. M. The Axis of the Pallets. LL. The two Pallets.

NP. Squares into which the two Pivots, which the Axis LM turns upon, are inſerted.

Q. A Nipple bored in a tranſverſe Manner, to yield a free Paſſage of the Axis LM, and bored alſo at Bottom to admit the Pivot of the Balance-wheel K, which inſerts its other Pivot into the Square marked R.

There is, in the Plate BB, a large Aperture deſigned to procure the free Playing of the Balance-wheel K, and of one of the two Pallets L, which is towards P.

S. The Fork, a ſmall Braſs-rod, bent at Bottom, and opened at its loweſt End, to receive and guide the Pendulum.

T. The Cycloid, a Braſs-lamina, which is double, and bent. See the Diſpoſition of it repreſented in Front, in the *Fig.* 8. TT.

VV. The Pendulum, an Iron-rod three horary Feet long, which makes three Feet 8 Lines one Second, the horary Foot being to our *Pié dé Roi*, (12 Inches) as 881 to 864. We could expreſs in the Figure but a very ſmall Part of the Length of the Pendulum.

The Rod is terminated by a ſmall Maſs of Lead X, weighing three Pounds, and of a lenticular Form, that it may cut the Air the better. It is ſuſpended by two Threads, which go backwards and forwards between the two Laminæ, TT, when you think it proper to uſe the Cycloid. The Threads by laying themſelves alternately upon the one and the other Lamina, ſhorten the Pendulum at every Time, and cauſe the lenticular Weight to deſcribe, not indeed a Portion of a Circle, but another Curve, which Mr. *Hugens* thought very uſeful to render the Oſcilations of a Duration always equal. Our beſt Workmen pretend that they ſtand in no need of it.

YY. A third Plate that bears the Dial.

χ. Is the Center of the Dial, through which the Axis of the firſt Wheel C does paſs.

The Dial has two Circles, one external and divided into 60 equal Parts, which are the Minutes or the Meaſure of an Hour; the other internal, and divided into 12 equal Parts, which are the 12 Hours.

Between the Plate AA and YY, is the Wheel $\beta\beta$ ſet upon the Arbor of the Wheel C, with a Canon which reaches as far as $\epsilon\epsilon$. This Canon carries in ϵ a Hand, which runs over the 60 Minutes in an Hour. It enters with a Friction, and with ſome Effort; ſo that the Arbor carries it along with it in its Revolution: You may nevertheleſs make it turn any way indifferently, by overcoming with your Hand the Reſiſtance offered by the Friction, without imprinting any Motion on the Axis of the Wheel C. This Wheel $\beta\beta$, which has 30 Teeth, carries away the Wheel of Communication $\gamma\gamma$, which has alſo 30 Teeth, and a Pinion of Six. This Pinion bears upon the Square δ which is faſtened to the Plate AA. It carries away the Dial-wheel ζ which has 72 Teeth, and is ſet upon the foregoing Canon $\epsilon\epsilon$, by Means of another Canon $\theta\theta$. The Canon θ, which is not ſo long as the Canon ϵ, carries θ a Hand ſhorter than that of the Minutes, to point out the Hours. It is entirely moveable, and is not actuated by the Canon of the Minutes: But it yields to the Motion of the Wheel ζ, whilſt the Canon $\epsilon\epsilon$ together with the Axis χ yields a Part to the Impreſſion of the Wheel C.

λλ Is a Wheel ſupported on the Axis of the Canting-wheel H, and of its Pinion G. This Wheel makes its Turn in the Time of a Minute, and bears 60 Figures, which offer one after another, in the ſame Space of Time, over againſt a ſmall Aperture marked Z, there to point out the 60 Seconds or parts of a Minute. The Axis of the Wheel H may be prolonged beyond the Plate Y, and a Hand be fixt to it, that will turn in one Minute upon the 60 Diviſions or Parts of a ſmall Circle, called the Circle of the Seconds.

This is the Manner in which the Wheel-work, determined as we have juſt mentioned, gives for every Hour 60 Times 60 Vibrations of the Pendulum, and points out 60 Times 60 Seconds. One ſingle Turn of the Wheel C, which has 80 Teeth, cauſes the Pinion E which has but 8 to make 10 Turns. For Eight multiplied by 10, makes 80. The Pinion E of 8 Teeth, turning 10 Times upon C, exhauſts its 80 Teeth. It is with the wheel, as it is with its Pinion E, and whilſt the Wheel makes 10 Turns to one ſingle Revolution of the Wheel C, it cauſes the Wheel H and its Pinion G, to make as many times 6 Turns; for this Pinion is of eight teeth, and the wheel F is of 48, which are intirely exhauſted by ſix Times eight. Therefore whilſt the Wheel C makes one Turn, and the wheel F ten, the Wheel H makes ſix Times ten or 60. Now, whilſt it cauſes the Wheel λλ, which it carries to make as many Turns; this preſents, at every Turn, the 60 Figures at the Aperture Z: Therefore, whilſt the Axis of the Wheel C carries the Hand of the Minutes over the 60 Marks, the Wheel λλ will ſhew 60 Times its 60 Seconds.

The Pinion I, which hath 24 Teeth, is twice carried away with the Balance-wheel K, by one ſingle Revolution of the Canting-wheel H which has 48 Teeth, the double of 24. Therefore whilſt H makes 60 Turns to one ſingle Revolution of C, The Balance-wheel K makes 120 Revolutions. Now the Wheel K has 15 Teeth, which in one Revolution ſtrikes ſucceſſively againſt each of the two Pallets, which makes 30 Strokes for each Revolution, and likewiſe 30 Vibrations of the Pendulum, *viz.* 15 Motions the one Way, and as many the other Way. Therefore, the 120 Turns of the Balance-wheel K, multiplied by 30, will give 3600 Seconds; that is, 3600 Strokes of the Pallets, and 3600 Vibrations of the Pendulum, for one Revolution of C, which is completed in an Hour.

The Revolution of the Wheel ββ is alſo of an Hour, it being made upon the ſame Axis. But this Wheel, which has 30 Teeth, will in an Hour exhauſt the 30 Teeth of the Wheel of Communication γγ, which cauſes its Pinion of 6 Teeth to make a Turn of the ſame Duration. Thoſe 6 Teeth take into the Wheel ζ which has 72, and together with its Canon θθ plays freely, that is, without any Friction upon the Canon that bears the Minute-hand. This Pinion, by its 6 Teeth, that is, by its intire Revolution, which laſts an Hour, exhauſts only ſix Teeth of the Hour-wheel ζ: Now 6 is 12 Times found in 72. Therefore, during 12 Revolutions of this Pinion, which are 12 Hours, the Wheel ζ will make but one Turn, and lead the Hand it bears at θθ over the 12 Hours of the Dial. Thus, two Revolutions of the Wheel ζ, by ſhewing twice the 12 hours of the Dial, will anſwer 24 Revolutions of γγ, of ββ, and of C.

This Clock placed at the Height of ſix Foot may, with a Weight of about 6 Pounds, go the Space of 30 Hours. The Weight is raiſed again before it is quite down; and that it may always bear upon the Wheel-work, which muſt be kept going without any Interruption, even whilſt the Weight is raiſed again; they commonly have recourſe to the following precaution, notwithſtanding other Methods which have been invented by ſome ingenious Clock-makers.

The String lays hold of the Points of the Wheel DD, and comes down on one Side towards the Pulley c, which ſupports the Weight g. This String goes up again, and paſſes under the Box over the Wheel d, which may, by Means of a Spring, and a Click, be turned freely towards d e, but not the contrary Way. Therefore when you pull the String from d to e, the Wheel yields to that Impreſſion. e muſt come down, and the Weight b aſcends ſtill weighing upon c, and conſequently upon the Wheel-work which it draws. The Spring comes down to f. It embraces the Pulley, to which is faſtened the ſmall Counterpoiſs which ſerve to ſtretch the Strings and to hinder, by means of the ſmall Points which are within the Groove of this Pulley, the String pulled by the large Weight from going off too eaſily. The String reaſcends from c towards the Box, where it paſſes over DD of *Fig*. 7. and joins to itſelf again at d of *Fig*. 9.

DIALOGUE XXIV.

RECAPITULATION *of the* ARTS.

A Query concerning the reſpective Utility of Arts and Sciences.

AFTER having ſurveyed the greateſt Part of the Works which the human Mind has invented, and which it improves or governs for the Good of Society; we might here examine a Queſtion curious enough which offers on this Subject, *viz.* Which of the two have contributed moſt to the Happineſs of Mankind, the Arts, or the Sciences? In order to render the Queſtion plainer, we ſhall propoſe it in a leſs general Manner. One Man may ſtudy deeply, for a long Time together, the ſpeculative, rational Grammar, Logic, Metaphyſics, and the moſt abſtruſe Geometry, and with this Apparatus ſet up for one who can underſtand the Opinions of *Deſcartes*, *Gaſſendus*, *Stair*, *Newton*, *Clark*, *Leibnitz*, *Hartſoeker*, *Sgraveſand*, *Keil*, and *Suedenbourg*, upon the Nature of Spirits and Bodies. Another Man, with a reaſonable Stock of elementary Geometry, and of experimental Learning, will get acquainted with the Operations of Commerce, with the fineſt Parts of the Art of Huſbandry, but chiefly with the Mechanics, and the moſt common Works of Men, not neglecting the Knowledge of the Earth, or the Hiſtory of Mankind: Now, I will aſk which of theſe two Genius's ſhall, in time, have acquired a greater Extent and Judiciouſneſs, and a greater Power to be of Service to Society. I ſhall be contented with inſiſting on the real Merit of that of the two Methods which is juſtified by the Effects, and leave the other to its own Worth. Can a Man be fond of what's good, and not wiſh to ſee all the World cultivating every where the ſeveral Parts of Natural Hiſtory, and chiefly by experimental Phyſics, which is one of the fineſt Parts of it.

The Reaſon of that Wiſh is plain. Coming from the Study of the Belles Lettres, without which Men will always be rough and unfit for Society, a Genius, even one of but a middling Extent, cannot follow the Reſearches of experimental Phyſics with any tolerable Exactneſs, without contracting a Fondneſs for thoſe Truths, the Knowledge of which has an Influence over all the Tranſactions of Life; without becoming more judicious in the Choice of the Means he uſes to ſucceed, and more ſteady in the Execution; in ſhort, without acquiring ſome Degree of Sagacity, either for the better Government of the Workmen he ſhall have to deal with, or to help his Friends now and then with good Advice. A Man engaged in this Road will always go farther than one who knows it not. Let us reduce our ſubject Matter to three Propoſitions which ſupport each other mutually, and the laſt of which is a Conſequence reſulting from the two foregoing.

I. The Knowledge of Man's Wants, and of the Means of ſupplying them, makes the true learned Man.

II. The Hiſtory of Man and Nature; Mechanics, and the whole experimental Phyſics, are properly the Magazine of the Supports of Society.

III. Therefore, the Hiſtory of the Productions of the Earth; the Hiſtory of Mankind, and experimental Phyſics, are the beſt Sources of true Science.

The firſt Propoſition is liable to no Diſpute. The Man, who ſhould except againſt it, would give but a very bad Idea of himſelf. For Society does abſolutely reject a Science void of Utility. Let a Man be ever combining and diving into Things which are out of Society, and which Mankind can apply to no Manner of Uſe; ſuch a Man is no longer one of our own Sphere; Society excommunicates him, or he rather makes himſelf a Schiſm with other Men.

The ſecond Propoſition needs not be proved. But it might be obſcured by an Equivoque. We every Day ſee, one might ſay, Men full of ſenſe and capable of giving good Advice in a Multitude of uſual Things, who nevertheleſs are ſeldom converſant with Books, and who never took any Notice of the Leſſons of the *Abbé Nollet*, nor of *Pliny*'s Natural Hiſtory.

What this Objection ſhews us very clearly, is, that Ingenuity is anterior to Books, and that what is in Books, proceeds from the Obſervations of the human Mind. The Man of ſound Senſe and good Advice juſt mentioned, has ſeen Things in themſelves; and had his Knowledge, as it were, from the firſt Hand. Although he did not get them out of Books, nor from the Leſſons of a Maſter, yet is he not without a good Stock of natural Logic, nor can he be ſaid not to have made a vaſt Uſe of his reaſoning Faculty. Nay, on the contrary, it is becauſe he reaſons well, that he fixes his Choice upon practical Things, and, on all occaſions, makes uſe of what he knows, to obtain what he knows not. Neither is he deſtitute of ſome Kind of Geometry, ſince Neceſſity has accuſtomed him to introduce a juſt Meaſure and exact Proportions every where. His chief Merit anſwers all my Wiſhes, and conſiſts in being an experienced Obſerver. His Eyes and Hands have taught him what he knows; And the Man you object to me, is the very Naturaliſt I am looking for. He is the Man I want, and let him be deſtitute of, or provided with Learning borrowed from Books, he is, in both Caſes, the Man I would have others reſemble; Books, Travels, and Inquiries, might lead him further than he is: But, in whatſoever Manner or Degree Learning may be acquired, and Minds formed, ſtill is it true, that they become uſeful to Mankind, only in Proportion to their Obſervations and Experience.

Men, or their Works, were never valuable on any other Account: And if the Sciences have, in our days, made any real Progreſs, it is becauſe they have, for this Age paſt, been aſſiſted by a greater Number of Experiments and Obſervations. All thoſe, in whom this taſte appears to be predominant, are Genius's happily reſtleſs, who will look into every Thing, and who can never ſee any natural Production, without inquiring into the Uſe it might be applied to; nor any Work of Art, without reflecting upon the new Improvements of which it might be ſuſceptible. This brings on directly Trials, Hopes, and ſometimes uſeful Miſtakes, which very often make us Amends for the miſſing of a thing ſuperior to all our Efforts, by the fortuitous Diſcovery of another, which we did not ſo much as think of.

We are indebted to Experience for the beſt Things we have acquired theſe hundred Years. It is to the Experience of *Torricelius*, upon Riſing of Waters, not by any Means to *Deſcartes*, that we owe the precious and fruitful Knowledge of the Effects of the air. When we burſt in a loud Laugh at hearing a Philoſopher gravely aſſert, that one ſingle Law of Vorticity was ſufficient, without any further Council or Command on the Part of God, to fetch out of Matter a Planet, a Man, a Horſe, and a Male and Female Inſect, together with the reproductive Germina of the ſame Species; it is not *Deſcartes* that has put us out of conceit with ſuch a pitiful Aſſertion; it is to experimental Obſervations of Meſſieurs *Redi*, *Valliſneri*, and *Reaumur*, upon the regular Generation of Animals and Plants, that we are indebted for the intire Demolition of thoſe ſhameful Opinions which made us attribute to Fermentation and Putrefaction, that is, to bare Motion, the Organization of Bodies. It is to the Obſervations upon Light of a *Scotch* Author, whoſe Name is *Gregory*, not to *Newton*, that we are indebted for the reflecting Teleſcope. This * had been invented, and even engraved before *Newton*'s Time. And *Newton* himſelf, if he may be ſaid to have underſtood better the Nature of Light and Colours, never did it otherwiſe than by following Light, Step by Step, through all its Paths, without ſo much as minding, at that Time, the Vorticules or Attraction, or any other ſyſtematical Hypotheſis.

The real Merit of our Age is its having renounced the Chit chat of Diſputes, and accuſtomed a Multitude of Men of ſound ſenſe never to build but upon what is experimental, hunting after it throughout all Nature, and in the very Shops of Workmen. This Way of ſtudying Truth was found ſo rational. that it was accepted of by the People of the *Beau Monde*, whom it really reconciled to true Learning, becauſe experimental Truths are never found attended with Uncertainty, Cavils, or abuſive Language. The Learned formerly reproached the Nobility with the little Value they ſeemed to ſet upon Sciences. Noblemen, on their Part, excuſed themſelves ſometimes upon the Inutility, and ſometimes upon the Diſagreeableneſs of Diſputes. Nothing of this Kind is to be met with in experimental Phyſics. It pleaſes both the Great and Small. It engages them all by actual Effects at preſent, and pleaſing Hopes for the future.

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* *See Optica promota*, 1663.

Courſes of phyſical Experiments, which take in the whole Syſtem of Nature, and of whatever is, or may be done for the Good of Mankind, are now opened with univerſal Applauſe, both among us and the neighbouring Nations. The Conferences and Lectures, which the *Abbé Nollet* has carried on at *Paris* for already fifteen Years together, have had a rapid Succeſs, and are as much liked now as they were in the Heat of the Vogue they had in the Beginning. All our Provinces conſult him one after another, or even invite him to come and be their Inſtructor. They would by all Means have his Machines, or even hear him himſelf in the Academy of *Bourdeaux*, in the Univerſity of *Rheims*, in the Academy of *Geneva*, and in the Univerſity of *Turin*; nay, he has had Princes and Princeſſes, Kings and Queens, for his Audience.

An Objection drawn from the Conſideration of the Danger the Belles-lettres are now in of being neglected for the future.

It muſt be confeſſed, however, that there are Men of Letters, who take the Alarm at ſeeing our preſent Age give ſo favourable a Reception to natural Hiſtory, to experimental Phyſics, which is a Conſequence of it, and to the Study of the ſeveral Works of Society. This ſeems to them to forbode an impending Decay of the Belles-lettres. “ No-body, “ they ſay, is ſenſible of that Danger, real as it is. “ Ought we not to be afraid of robbing every Mind “ of all Sorts of Charms, and rendering them as “ dry as our old Scholaſticks, by accuſtoming them “ to the diſmal decyphering of Naturaliſts, who

“ are reſolved never to expreſs their own Thoughts in
“ any other but algebraic Characters? We might,
“ however, put up with the tireſome Part of their Method,
“ were it conducive to ſomething very agreeable,
“ or of great Profit. But, all theſe gloomy Operations
“ aim only at eſtabliſhing Affinities, Electricities, Attractions,
“ Monades, or any ſuch enigmatic Powers, as
“ little fit to make us underſtand the Nature of Beings,
“ as the Term of concoctric Faculty was formerly to
“ explain Digeſtion.

“ The Sterility, in Point of Learning, is not the
“ only Thing thoſe can be reproached with who diſdain
“ the Belles-lettres, and give the darkeſt Opinions the
“ pompous Name of Sciences. What Style, what Turn
“ of Mind muſt we now expect from young People accuſtomed
“ to the Ways and Notions of ſuch of our
“ modern Philoſophers, as *'SGraveſande* and *Swammerdam?*
“ The former, though endowed with much
“ Penetration, never could treat Phyſic in a rougher
“ and more abject Manner than he has done; nor could
“ the latter, though true and exact in the main, have a
“ more gloomy and more diſguſtful Way of handling
“ Natural Hiſtory. Shall we not revive Barbariſm, by
“ inviting our Youth to peruſe the Works of Naturaliſts
“ and Mathematicians?” Such are the Apprehenſions of our Men of Letters, at ſeeing natural Knowledge get the upper Hand every where.

We may boldly propheſy, that their Alarms are utterly groundleſs. The Public is the beſt of Maſters; and what we are to expect from its Inſtructions, may eaſily be foreſeen. They would look upon him as a hare-brained Man, who ſhould go out of his Houſe with a Plume of Feathers round his Head, and all the brilliant Attire of an Actor on the Stage. They would, on the contrary, judge him a moroſe humourſome Fellow, who ſhould take it into his Head to go and pay Viſits in his Night-gown, and with all the plantive Accents of one tortured with the Gout. The Public is not a whit more indulgent to bad Writers. It has long ago contracted a Diſguſt for, and left in Oblivion thoſe Diſcourſes where the Belle Eſprit ſtrove to appear, rather than do us any Service. Whereas they have always received with Diſtinction, the man who had their Service chiefly in View, without, however, neglecting an exact Decorum. In the Times when the Scolaſtics were the only Perſons admitted into the learned World, the Public made really but very little of them, and preferred Ignorance to the Neceſſity of feeding for-ever upon tireſome Diſputes. We, on the contrary, always ſaw them ready to liſten to thoſe who made the Beauties of Language go hand in hand with the Uſefulneſs of ſound Learning. They make Choice of the beſt Writers, and ſtill read with Pleaſure what was judiciouſly written many Ages ago. They hardly ever read *Stephen Paſquire*, whoſe affected Style was never to their Liking, whilſt they ſtill delight in peruſing the Memoirs of *l'Etoile*, one of his Co-temporaries, who, a few Words excepted, ſeems to have been educated among us. The Public grew tired with the Roughneſs of *Mezerai*'s Style in his Hiſtory at large: Whereas, after three hundred Years, they ſtill admire that ſmooth eaſy Way, that good Senſe, and Politeneſs which *Philip de Commines* had refined and perfected at the Courts of *Burgundy*, and *France*. Thoſe of our Modern Authors, who have written uſeful Books in an elegant Style, will then be read over and over, and always with ſome Profit. The Public never did, at any Time, or in any Kind whatever, reject thoſe who offered their Services in Writings as clear and polite as they had a Right to expect. By good Luck, our dreaming Philoſophers have moſt commonly been the moſt unpleaſant, ſo that one might lay it down as a Rule, to miſtruſt Learning in Proportion to its being inacceſſible. On the contrary, our Naturaliſts, and our Obſervers are generally good Writers; nor is the Number of them inconſiderable. Nothing can be more intelligible or full of greater Fire, than the *Italian* of *Vallisneri*. The *Latin* of the Memoirs of *Zanotti*, Secretary of the Academy of *Bologne*, is comparable to that of *Cæſar*'s Commentaries. *Mortimer*, *Evelyn*, *Laurence*, and *Miller*, have gained the Eſteem of the *Engliſh*, by taking the Trouble to tell us, upon Agriculture, the Things they had ſeen, and by telling them, beſides, in a moſt intelligible Language. What Benefit cannot be reaped from the Hiſtory of Drugs and other things, which Meſſieurs *Lemery* and *Geoffroy* have given us? The reading of Mr. *Bazin*'s Hiſtory of the Bees is no leſs engaging than beneficial. What Services have we not received? And ought we not ſtill to expect from the judicious Author of the Culture of Peach-trees (*a*)? Who is the Virtuoſo that will not hear with Amazement, and read with Eagerneſs, whatever comes from the excellent Pen that gave us the Hiſtory of Inſects; and not to take our Examples from Academies which are chiefly intent upon admitting no frivolous Work, nor any barbarous Language; are not *Joblot* and *Baker* as good Diſſertators as they are good Artiſts? Do not *Julian le Roy* and *Peter Gaudron* write a Memoir upon Clock-making with the ſame Eloquence and Exactneſs which we admire in their Pendulums? *Sully*, though one of another Nation, has acquired a Right to be read, by ſpeaking our Language very well. Nothing more common at *Paris* and in our Provinces, than to find Engineers and Mechanics no leſs well educated than naturally induſtrious. It is no longer a Rarity among our Neighbours, any more than amoug ourſelves, to ſee the Man of Wit, the Virtuoſo, the Man of Quality, add a Laboratory of Mechanics to a choice Library. It is ſtill more common to ſee Artiſts have, in their Laboratories, a Caſe full of ſelect Books, where you will find the Univerſal Hiſtory ſtanding by *Bion*'s Inſtruments, and a *Rollin*, by the Mechanics of *Trabaud* (*b*).

Thoſe then, who ſeem to take the Alarm at ſeeing experimental Phyſics ſo much in Favour, would do much better to perſuade themſelves to ſhun the ſoporative Inutility of an indolent Literature, than exclaim againſt the Progreſs of uſeful Learning; ſince it invites them to Emulation, by ſhewing every where no leſs Politeneſs than Activity: It teaches them never to ſeparate the Solidity of all Banches of Knowledge from the ſeducing Charms of Wit.

(*a*) Paris, *Chez les Fréres Guerin.*

(*b*) *A Treatiſe on Motion and Equilibrium.*

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DIALOGUE XXV.

COMMERCE.

The Matter of Commerce.

WHAT the Arts and Profeſſions collect or faſhion for our Uſe, Commerce communicates to us by Exchanges, or by regular Compenſations. All our foregoing Diſcourſes are an almoſt perpetual Expoſition of the Matters of Commerce, ſo that it would be needleſs to return to that Subject. Some of theſe Converſations ran upon the Places where the greateſt Traffic is carried on, and in particular, upon the preſent Diſtribution of Commerce, both in our Companies and our *European* Colonies on the ſeveral Continents.

The Places of great reſort.

The Operations of Commerce.

As to the moſt common, which are alſo the beſt Operations of Commerce; I know, my dear Friend, that your Education was too good to have deprived you of the Advantages of knowing them. You are acquainted with the Merit and Proceedings of them, becauſe you have had Maſters, who at the ſame Time that they guided you in the Study of the Belles-Lettres, and of Nature, have always kept ſome of your Hours in reſerve for the Study of the Wants of Society, and the Means by which they are ſupplied. The Coins, Weights, and Meaſures of the Antients, have been reduced for you to our Standard, and the reſpective Value of theſe Things among us have been ſufficiently compared to you with that which is current among our Neighbours. How often have I ſeen you, coming from a Friend of yours who was a Merchant, give me a faithful Account of what the Change, Letters and Bills of Exchange were, when a Payment was to be remitted from one Place to another, without being charged with the Riſks inſeparable from the Tranſporting of the Money? I have ſeen you aſſign, with great Exactneſs, the Difference between the lawful Benefit of the Change, and the Intereſt required againſt the Laws, over and above a Capital lent to be returned. I have heard you expoſe the Arguments alledged in the Favour of arbitrary Uſury, and then ſtyle them *Verba & Voces*; becauſe we find no Security any where but in the Rules preſcribed by the Church, and invariably maintained by the ſecular Judge, both to fix our Reaſon, and to ſtop all Avenues to Cupidity. I have ſeen you greedily catch at the wiſe Principle which maintains the Tranquillity of mankind, by preferring the Precepts of the Church to worldly Arguments; becauſe the Rule of the Church prevents the Ruin of private Men, by the juſt Moderation of the Profits; whereas Cupidity, even the moſt odious, never fails taking Shelter under the Protection of falſe Philoſophy. It ſeduces itſelf: It diſguiſes its Uglineſs to its own Eyes, by dreaming that it is the Refuge of Men in Diſtreſs. Cupidity never does any Thing without authorizing itſelf with ſome Argument, nay, often with ſpecious Sophiſms, which are nevertheleſs frivolous, becauſe void of Security.

Bills of Exchange.

Your Instructors took care to acquaint you with the vaſt Advantage reſulting from the Remitting of your Money to *Lions*, *Rome* or *London*, by a Letter directed to your Correſpondent, to draw your Sum upon a Banker or Merchant reſiding in the Place. You have been acquainted with the future Utility which may be derived from this Bill of Exchange, by tranſmitting it into other Hands, as an Effect equivalent to good Coin. Nor did they let you be ignorant of the Cautions to be uſed for proteſting the Bill, when the Perſon, directed to pay, refuſes to do it. In ſhort, you have been acquainted with all the Riſks, and with the neceſſary Bounds of Commerce in Paper, which may forward ſome previous Operations between People of Credit, but which degenerates when it becomes current Money. For metalic Money is a real Good, and a ſolid Compenſation which may replace all. But Paper-money is no more than a Piece of Leather, of itſelf, of no real Value or Utility; and the Price which a few private Men gave it by ſetting their Names to it as a Security, dwindles at once by the Fall of their Credit or Fortune.

It being not in your Power to learn theſe Operations by the Practice of Commerce, nor to have always at Hand the kind Inſtructions of your Friend above mentioned, I have often ſeen you replace or prepare them, by the reading of the Treatiſe of Commerce of *Samuel Ricard*, ſometimes by that of the *Parfait Négotiant* of *James Savary*, aud moſt commonly by that of the Dictionary of Commerce, compoſed by his two Sons, one Inſpector of our Manufactures, the other Canon of St. *Maur*, a very good Writer, and a better Citizen.

* There is no Book leſs fit than this, to pleaſe a Genius accuſtomed to metaphyſical Abſtractions: Nor is there any more engaging for thoſe whom a judicious Maſter has taken to inſpire with the Taſt of uſual Sciences, and with a fond Love for a public Good. You have often beſtowed whole Days and Nights upon that Reading; ſometimes conſidering the Fairs of *Archangel*, of *Lions*, of *Bander-Abaſſi*, or of *Porto-Bello*; ſometimes poring over a Point of natural Hiſtory; and have been taken up another Time with the Manner in which Merchants keep and regulate their Books of Account, and with their Method of making their Payments; with the Rules of the Aſſociations; or with the expeditious Way of deciding their Differences between Merchant and Merchant before the Judge Conſul; or with the Cuſtom of having the Effects you venture at Sea made good to you by the Inſuring-Office, upon Condition of giving five, ſix, or ſeven *per Cent.* upon the Returns; ſo that there being a great many more advantageous Returns than Shipwrecks and Loſſes, the Benefit of the Inſurers is great, and the Tranquility of the Inſured perfect.

Inſuring.

Nor will I admit the Reflection you made one Day upon the charming Variety of this Book, and the indiſpenſable Neceſſity of knowing the greater Part of

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* *The Eloguum of the Dictionary of Commerce.*

The Defects and reforming of the Dictionary of Commerce.

Things it contains. People will have it, ſaid you to me, that ſome of the Memoirs of which Meſſieurs *Savary* have made their Book, may be improved in ſome Degree, I wiſh, and hope it with all my Heart. But it, actually, is our beſt uſual Philoſophy.

The Spirit of Commerce.

May all our Men of Parts become Philoſophers after your Manner, and learn in that Book, or otherwiſe, how to ſerve the Society for which we were born. To render Men happy whether in the firſt or the ſecond Stations of the World, by procuring the Facility of the Communications, and by multiplying the Helps they ever ſtand in need of, is without doubt the moſt pleaſant Philoſophy: It is the very Diſpoſition that conſtitutes the true Citizen; but it is, at the ſame Time, the Definition of the Spirit of Commerce.

The Hope of a lawful Profit may be a Spur to Men of all Stations to improve their Talents: But, this is not properly the Caracteriſtic that diſtinguiſhes the ſkilful Merchant from the Orator or the Artiſt. The moſt ſordid Thirſt after Gain, may as well ſit upon the *Flower de Luces*, as embark for *Coromandel*: But it is the Spirit of Equity and Concord that makes the true Magiſtrate: And it is an eager Deſire of procuring to one's Country the Enjoyment of the Things it wiſhes for, that renders a Merchant truly eſtimable. An ingenious Merchant is ſomething more than barely a good Citizen. The Extent of Service he does his Country renders him a Stateſman as it were; and of all Sciences, the Progreſs of his is, next to Religion, the moſt deſirable.

“A general Trader of good Senſe, ſays Mr. *Addiſon*, “ *, ſpeaking only of an honeſt Diverſion, is pleaſanter “ Company than a general Scholar.” We are very happy to have the Aſſiſtance of Books. They are the firſt Support under our Want of Experience. But the Antients and a great many among the Moderns, have rather put into their Books the Things which they had either heard or thought, than what they had ſeen or experienced. We are very far from ſetting light by them; nay, what Trouble do we not give ourſelves to be able to underſtand them? But it is plain, that thoſe, who have ſeen and practiſed Things, are of right our firſt Libraries.

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* *The Spectator. Vol. I. No. II.*

I own that Books may, like *Pliny's*, be of Help to us, even in falſe Aſſertions, provided we take care to clear and rectify every Thing by Witneſſes, Vouchers, and Experience; But liſtening to an experienced Trader, is being at the Source of Things. What we learn after this Manner, is not disfigured by luxuriant Recitals, nor by any Mixture of the Thoughts of others. He is himſelf a ſure Commentator, as well as a faithful Warranter of what he relates. He has been Eye-witneſs of the Whole: The Fear of Miſtakes has rendered him mindful of every Particular; nay, is not that very Fear the beſt of Guides to lead him to any Diſcovery?

The ſeveral Diſpoſitions of Sea, Coaſts, and Provinces, the Meaſures of Paſſages over the Sea, and the Dangers of Roads, the Wants and Intereſts of Nations and their predominant Inclinations, the ſeveral Methods of varying one's Conduct according to the Characters, Cuſtoms, local Productions, natural Curioſities, and modern Inventions of Places either to procure Helps heretofore unknown, or to improve Things actually uſeful; add to ſo many agreeable Branches of Learning, the Origin, the Apparatus's, and the Exchange of all uſeful Matters; theſe are the Topicks upon which the Converſation of a ſkilful Merchant commonly runs. His ſound Judgment has helped him to make his Profit of every Thing: But the Variety of the Objects, and the Neceſſity of taking a wiſe Reſolution on any new Emergency, have no leſs extended his inborn Sagacity, than they have imbelliſhed his Converſation.

You ſee, Sir, that a great deal more than bare Pleaſure is to be expected from ſuch a Man. He is the Guide of Society. Every body aſks him his Opinion or his Advice. He is the Soul of the Enterprizes of both his Family and City. How many have we ſeen, who had made Trade their ſole Occupation, become the Council of our greateſt Miniſters of State, and even get ſo far into the Favour of our King, as to be intruſted by them with the higheſt Negotiations, and raiſed to the Claſs of the Nobility.

Here I might obſerve to you a Multitude of Things concerning the high Notion we ought to entertain of Commerce; upon the Uſefulneſs of Travels and Voyages; upon the Manner of making them with Profit; and upon the ſeveral Perſons who ought chiefly to be inſpired with a Love of Commerce. But, inſtead of telling you my own Thoughts which are of but ſmall Authority on this Subject, I will communicate to you a Converſation of which I was a Witneſs not many Days ago. It ran entirely upon the Queſtion which you have moſt at Heart, as well as myſelf, to ſee fully explained on this Subject. And it will perhaps make the more Impreſſion on your Mind, as it paſſed between two Men of uncommon Judgment, one of whom is a Gentleman of great Diſtinction, and the other a Merchant thoroughly verſed in the greateſt Enterpriſes.

The SEQUEL of

DIALOGUE XXV.

The LOVE *of* COMMERCE *and* TRAVELS.

PRAY help me, ſaid the Gentleman to the Merchant, to a proper Method of finiſhing the Education of my third Son, and of promoting the making his Way through the World. My two eldeſt are in the Army. The Studies of the youngeſt have had a tolerable Succeſs. Methinks that the conſtant Habit I have kept him in tranſlating the pureſt among the *Latin* Authors, and of giving a perpetual Account of them both in *French* and *Latin*, has made him acquire not only a clear Style, but alſo a delicate Taſte, without which, Learning is to me of little Signification. He ſpeaks *Latin* purely enough, and even with ſome Degree of Facility. This little Talent, which I was fond of prucuring him, is a Reſource in Travels. I always had them in view for him; and I am reſolved to make him ſee the World. But there is a proper Method for that, and it is in order to render his Travels uſeful, that I have Recourſe to your Experience.

Sir, replied the Merchant; I will not tell you any Thing but what you may be as well acquainted with as myſelf. If I preſume to tell you my Remarks, it is becauſe you will have me to do ſo, and our Converſation could hardly run upon a more agreeable Subject.

Our two Ways of Travelling.

There are two Methods of making young Gentlemen travel. They firſt conſiſts in putting them into the Army. This I need not mention before a military Man. All I ſhall ſay, is, that it might eaſily be rendered more profitable, by adding to it what I have obſerved was wanting in the ſecond Method. This is the only one I ſhall mention to you. Every body knows it to conſiſt in having a young Gentleman attended and conducted by a Governor to the fineſt Cities in our Neighbourhood, and chiefly in *Italy*.

Theſe Travels, made by Men not in the Army, are not frequent among us, and very common among Foreigners. They ſeldom ſee us in their Country, except in Time of War; whereas a Peace is hardly concluded but they are inceſſantly ſeen with us. Pray, do they do better than we who are no Travellers; and when we go abroad, do we do it as properly as they? It ſeems that we make the twofold Miſtakes of Travelling too little, and not as we ought to do.

Firſt, we travel little. This Conduct of the *French* is very well known, and often reproaches them. What is their Excuſe for it? We may very well content ourſelves, they ſay, with our natural Advantages. We enjoy all the Sweets of a polite Society at Home. Commerce is not neglected in *France*, no more than Arts and Sciences. What need we go ſo far, and at ſo much Coſt, purpoſely to hunt after Things we have ſo near at Hand?

Such is the Plea of down-right Prejudice, aſſiſted with a great Degree of Lazineſs and a good Stock of Self-love. Nothing is fitter to keep our Spirits and even our Talents in a State of Weakneſs, not to ſay of Imbecility, than to confine them for ever within the ſame Circle of Objects. Behold a good old Monk, who has been in Retreat from his Infancy, or a Man in Years, who has always lived at a Diſtance in ſome Corner of our Provinces, they will both of them, in every one of their Converſations, bring you back to the ſmall Number of Ideas which are familiar to them, and notwithſtanding your Indifference for the Character and Conduct of *Dom. Prior*, and *Dom. Célereir*, of Mr. ſuch a one the Conſul, or of Mr. what d'ye call him his Deputy, your Ears will ring with an eternal Repetition of their Names. Unleſs you chuſe to aſk the Man ſome Queſtions concerning the other Particulars of his Order or Town: In ſuch Caſe he will give you full Satiſfaction. But, you will ſoon be tired with Converſation which never goes beyond theſe narrow Bounds: and it is becauſe we cannot converſe with others upon any Topicks but theſe borrowed from our own Ideas, that we ought early to ſtore our Minds with a ſufficient and choice Stock of them. We all of us, who compoſe one and the ſame Nation, reſemble the Inhabitants of the ſeveral wards of the ſame Town. The good people, about the *Place Maubert*, have an Accent not to be found in the Inhabitants of the *Fauxbourg St. Germain*. Nevertheleſs, the Ground of their Language is the ſame, and it is, within a Trifle, the ſame Articulation. Therefore, an Inhabitant at *Paris* will probably open his Mouth better than one born in *Picardy* or *Champaigne*, and be more gracefully jocoſe than an Inhabitant of *Franche Comté*, or of *Bretagne*. But, theſe are very ſlight Differences. The five Men above-mentioned, will be upon the ſame Level in any other Reſpect. The ſame Ideas, the ſame Practices, the ſame Concerns and Principles, and conſequently the ſame Bounds in their reſpective Capacities. We muſt needs paſs under another Heaven, and go among Nations that have Ways of thinking or living quite different from ours.

The firſt Thing we do there will be crying out that this is not our Air, and that one eats and is ſerved far otherwiſe in *France*. But a judicious Foreigner will obſerve to us, that our Forks will go a hundred Times from the Right to the Left, and as many Times from the Left to the Right: That, for their Part, they think it more unaffected and more commodious to leave it on the Left-hand, and to accuſtom the Left-hand to do that Service; the ſparing of two hundred needleſs Croſs-motions, not being to be thought trifling. He makes us obſerve that their Meats are wholeſome: Whereas when he was at ſome good Table in *France*, where they were extolling the Exquiſiteneſs of a Ragout, if he happened to take a Spoonful of it, he found that he ſwallowed a Pudding or Stuffing made of Fleſh and of Bones calcined in Brandy, that was diſguiſed under the Figure and Name of a Fowl; or that it was a Compoſition of Ham and Veniſon drowned in Fennel-ratafee, and perfumed with ſweet-ſmelling Spices: So that he put into his Body, if not a whole Mine, at leaſt a Granado ready to take Fire.

Theſe trifling Remarks are ſufficient to make us ſenſible, that there are a great many other Things among us, which might be done in a much more rational Manner than they are; and it is only by the Trial of the different Methods and Characters, as well as of the different Productions of both Nature and Induſtry, that we acquire the Capacity, the Judgment, and the Induſtry we ſtand in need of, and the Means of bettering our Condition in every Reſpect. We begin by ſuppoſing, firſt of all, that our national Practices are the Rule of what ought to be done: But, pray, is ſuch a Maxim very juſt? And have we in reality acquired the Privilege to propoſe ourſelves as the Models of Mankind?

Let us not loſe our Time in proving the palpable Advantage reſulting to us from the Cuſtom of collecting Ideas of Compariſon by the Aſſiſtance of Travels. It is a Truth really avowed by us all: And we may judge of it by the kind Welcome which Foreigners meet with among us; by the many Queſtions we are for ever aſking of them, and the eager Deſire we have of ſeeing or acquiring the Things which come from abroad. What I mean here is plain, and we even begin a little to think of returning Foreigners the Viſits we receive from them. We have already ſeen many young Gentlemen venture over the *Alps*, or over the *Channel*. 'Tis to be hoped it will become a Faſhion. Vanity makes us underſtand a great many Things, which Reaſon may afterwards improve and render profitable.

Motives ſufficient for Travelling.

If I ſaw my Friends reſolve to let their Children go through the World, I would obſerve to them, what a groſs Miſtake it is to undertake theſe Travels for frivolous Ends, or from too narrow Conſiderations. The Merchant thinks of nothing but his Profit. The Antiquary recommends nothing to his Son but a ſtrict Search after Medals and uncommon Monuments. The Lover of polite Arts has the young Traveller guided by a Deſigner, who, during the whole Voyage, will never ſpeak to him but of the *Titian* or the *Georgean*, and of the Compariſon between the Schools of *Rome* and *Lombardy*, and between thoſe of *Flanders* and *France*. A Father, not quite ſo learned as theſe, has other Things in View. He will tell you he has a Mind to enable his Son to pay his Share of the Converſation. He muſt have heard the Chime of Bells of *Antwerp*, he muſt have heard the Clock of *Strasburg* ſtrike, and have ſeen the Tower of *Piſa*, the Caſcade of *Tivoli*, the Dog's Grotto, the Mouth of Mount *Veſuvius*, and the *Venetian* Carnaval.

Let us bring on, with nobler Views, the Deſtination of a young Gentleman who may in Time be intruſted with the Management of ſome Enterprize of great Moment; be made a Magiſtrate, an Intendant of a Province, in ſhort, be raiſed to ſome eminent Poſt in his own Country. He muſt travel by all Means; but he muſt do it like a Man, not like a School-Boy; not with a Governour, but with a Friend, on whoſe Judgment, Zeal, and Knowledge he may entirely depend. His Travels will be uſeful to him in Proportion as he ſhall be already provided with ſome Experience and Curioſity. Let us make the neceſſary Preparations for his ſetting out on the intended Courſe.

The Prepara-tions.

You will ſee Travellers wholly mindful of taking ſuch Letters of Recommendation, as will procure them an eaſy Acceſs and a favourable Reception every where. This, to be ſure, is a wiſe Precaution. You will ſee others take exact Liſts of the Roads, of the beſt Inns, of the Manner of laying out Money, regulating Expences every where, and of the beſt Means to avoid being hurt by Heat or Cold, and by exceſſive cold Nights. Nothing, in ſhort, eſcapes their Prudence. But let us, without neglecting any Part of this unavoidable Detail, yet chiefly recommend to our young Traveller a previous Caution of infinitely greater Moment than all the foregoing. Let us fortify him before hand with a Principle that may ſhield his Religion againſt all the Dangers of travelling. The Maxim, which is to be his Bulwark and Guide, is of the utmoſt Simplicity, and eaſily retained, *viz.* That *the Chriſtian Religion can neither be ſettled nor learned by Diſputes or metaphyſical Reaſonings*; *but only by an antient Revelation made to Mankind, and by a Miſſion of Witneſſes, who never ceaſed from Age to Age, to hand down to us what they had learned and received from their Predeceſſors.*

A Maxim, which ſecures the Religion of a Traveller.

This Principle now eſtabliſhed by a Crowd of Monuments, and the only one proportioned to the narrow Bounds within which the Intelligence of the moſt ſagacious Minds is invincibly reſtrained, ſhelters a young Traveller from being influenced by the Sophiſms of a proud conceited Philoſophy, which notwithſtanding the Inſufficiency of human Reaſon even in natural Things, pretends to eſtabliſh it as the Judge of what we are to believe or hope. The ſame Principle preſerves our young Traveller from any Danger, ſince by ruling both his Conduct and Belief upon the Unanimity of the Teſtimonies, he at once guards againſt bad Examples, and is not influenced by a Conſideration of the Faults of the Witneſſes themſelves.

Being once provided with this Principle, he wants but a New Teſtament and the Book of *the Imitation of J. C.* to preſerve Sentiments that may render his Joy perpetual and equal to the Purity of his Manners. We live in Times where it is no Rarity to find, that the *Telemachus*, who travels, is wiſer and better than the *Mentor* given him for a Guide.

Outward Toleration always neceſſary.

But, at the ſame Time that the young Traveller is made Proof againſt all the Attacks of a dark Reaſon, which muſt be weak, ſo long as he oppoſes to them a Multitude of Witneſſes, and the ever-ſufficient Light of what God has manifeſted to us, he muſt alſo be inſpired with an invincible Mildneſs and Moderation towards thoſe who have not his Way of Thinking. There has never been but one Miſſion: He muſt then deteſt in his Heart all Schiſms, ſince they mutually deſtroy each other, and have by no Means the Character of the divine Authority, which has eſtabliſhed but one ſingle Miniſtry. But he ought never to hate thoſe who remain ſeparated from us. He muſt have no Toleration upon the Plurality of Miſſions, ſince there is manifeſtly but one, and you need but open your Eyes to ſee in what Communion it has been perpetuated for theſe ſeventeen hundred Years. But, there is a juſt and neceſſary Toleration. It is that outward Indulgence which neither kills nor abuſes any Body, becauſe it has an Affection for all Mankind. A Traveller cannot then be too often told, that the Spirit of Charity is the Soul of Chriſtianity; and that this Spirit, which ſurpaſſes all Animoſity in true Chriſtians, makes them become, by their unalterable Mildneſs, the moſt lovely Part of Society.

We need not leave our Country, to become good Chriſtians; nor is it for that Purpoſe that we undertake Travels. Nay, all is very well when the young Man's Piety is not altered by them, and has been ſheltered from all outward Attacks. Let us now ſee for what Purpoſe his Travels have been undertaken. It was to render him more ſociable, and more compleatly verſed in the Things he knew already. If he does not gain theſe two Ends by travelling, he had much better have ſtay'd at Home.

Becoming more ſociable, the firſt Benefit of travelling.

Let the young Traveller be called to manage the moſt important Affairs, or let Trade alone be his Vocation; the firſt Benefit, expected from his Travels, is his becoming perfectly ſociable. That ſincere Charity, which we have made the Ground of his Piety, is likewiſe the true Seed of that amiable Quality, which we would fain render perfect by his Peregrination. If he is fond of procuring the real good of Society, he is generally loved by it. If he delights in ſerving Men with a warm Zeal, he will become the Object, I will not ſay of their Adoration, but of their Reſpect and Confidence. Nevertheleſs, it happens ſometimes that a Man, though with a great Stock of Love for Mankind in general, yet has ſtill ſome Remains of an unſettled Diſpoſition, blunt inconſiderate Ways, and Airs of unconcernedneſs and Diſtraction.

The firſt Merit of Travels, is the radical Deſtruction of all Roughneſs, and the ſuppreſſing of even the leaſt Shadow of Pride. There is no ſmoother File than a long Uſe of all Sorts of Characters. The brighteſt Diamonds were rough before they were poliſhed. The Abode which a young Man, born in one of our Provinces, begins to make in our Capital, is but at firſt rough Hewing. The Variety of Affairs and Travels gives him the true Luſtre. A young Man who paſſes from one Town to another, but chiefly from Nation to Nation, is under the Neceſſity to make his Reſolutions, his Anſwers, and his whole Conduct, tally with the Exigences of Circumſtances. He every where takes Notice of what is liked and of what may pleaſe. He preſently bids adieu to all Words and Ways that may be either offenſive or tireſome. It would be needleſs to inſiſt upon this, becauſe it is a Thing tried and acknowledged, that the Rich, and Great, if they will not run the Riſk of being either mute Idols, or ſavage Deities, muſt leave that Circle of Men who cringe for ever before them.

This firſt Benefit of converſing with many Nations, is indeed liable to theſe two Inconveniences, *viz.* The young Man's having a Love for Change, or his becoming a Player. I own that the more we have ſeen and known, the more likely we are to hate, and the more able to hurt Mankind. Theſe Evils have no other Remedy but a ſolid Ground of Religion; which is the Baſis of the Qualities I have previouſly ſuppoſed in the Traveller. Religion alone renders a Man happy, by fixing and ſetting Bounds to his Deſires: It alone gives him that Politeneſs which can make him ſerviceable to others. I dread a wicked Man, in proportion as Travellers and Society have improved his Underſtanding. But, a Man of Senſe that has ſeen much of the World, if he is a Chriſtian beſides, has not only a clear Head, but is poſſeſſed withal of ſuch Qualities as will render him univerſally amiable. Every Body will deal with him. He has as many Followers as Acquaintance, and all the World correſponds with him, if not out of Inclination, at leaſt for Self-Intereſt.

Experience, the ſecond Benefit of Travelling.

Beſides the Qualities which render Man truly ſociable, we ſhall ſtill find our Traveller endowed more than any other with ſolid Learning, of which we are deſtitute merely for want of Practice and Experience. Advantages like theſe can never be reaped by a Traveller, who is as yet no more than a Child. If you ſpeak to him of the Operations and Profit of a vaſt Manufacture, all your Words glance upon, but never enter his Ears. All he has taken Notice of, is the Noiſe and Dancings of the Mallets of the Fuller's Work-houſe. Speak to him of the Tomb and the Particulars of the Life of a Prince of the thirteenth Century; the hiſtorical Facts, the Cuſtom of thoſe Times, or the Manner of Carving, which characteriſes them, give him no Manner of Concern. His Eyes are fixed upon the Symbol of Fidelity, which is at the Foot of the Figures; and the little Spaniel-dog is the only Thing he has retained of the whole Monument.

Civil and natural Hiſtory neceſſary to a Traveller.

None but Men of riper Years are capable of improving by every thing they ſee, becauſe an extenſive Knowledge, both of the civil and natural Hiſtory of the Country which the Traveller intends to viſit, are abſolutely neceſſary.

Can he well enter into any Country without being provided with the firſt Grounds of the Hiſtory, the ſeveral Monuments of which he is going to meet with? In order to catch more quickly at the Meaning of them, and connect them the better in his Memory with the Perſons,

Times,

Times, and Events, I ſhould be glad he had made to himſelf a pretty exact Almanack, not only of the ſeveral Writings of each Century, but alſo of the Dreſſes, Exerciſes, and Ornaments peculiar to every one. Thus the Manuſcripts, the Coins, the old Carvings, and all ſuch Remains become intelligible to him. He is able to draw the Figures of them, and finds the whole again in his Memory or his Pocket-Book: The Proviſion of Ideas he has collected, are to him in lieu of Company. Every Thing ſtops him in his Travels and Walks: Every Object amuſes him in his Solitude. He is even never alone, as he knows how to converſe with the Men of all Ages. He finds again their Wars, Inventions, Games, and Pleaſures. He will tell you at once; This Tapeſtry is of the Reign of *Lewis* XI. Theſe are the Head-dreſſes and Shoes of the Ladies of the fifteen Century. Here is the Architecture that was in vogue under *Charles* VIII. and *Lewis* XII. and which began to be out of Faſhion under *Francis* I. and was almoſt totally forgotten under *Henry* II. He is no longer a Stranger any where: He points out to the very Inhabitants of the Places he goes by, Monuments which they themſelves knew not: Like *Cicero*, who ſhew'd the Inhabitants of *Syracuſe* the Tomb of their Fellow-citizen *Archimedes*.

Hiſtory and polite Literature may indeed adorn the Mind of a Traveller, and contribute to explain Antiquity to him in his Reſearches: But, Natural Hiſtory, which our Antiquaries have too much neglected, may lead him conſiderably farther, and render him of the utmoſt Service to Society in Point of Sciences and Government.

We know certain Sciences and pretended Secrets, which, though ſpoken of with a very myſterious Pageantry, yet have no real Certainty, and can be applied to no profitable Uſe. It is not the ſame with Natural Hiſtory. Let us take the fineſt Parts of it, for Inſtance, the Experimental of what is perceived both in Nature and the Mechanics; and let us add to it the Matter of univerſal Commerce. A young Man, who has ranged in his Mind the Things which human Induſtry faſhions and cultivates, together with the fineſt Attempts it has made to facilitate the ſeveral Uſes of them; ſuch a Man cannot travel without looking with equal Eagerneſs and Profit on Objects which others do not even dream of. Every Thing fixes his Attention, and gives him Pleaſure. Here, he admires the Simplicity of a Machine, which, without changing the Work or Motion of the Horſe, cauſes the two Pails of a Well ſucceſſively to go up and down contrary Ways. There, he obſerves the happy Multiplication of a Force which otherwiſe would be twice or thrice leſs. You hear him extol and wonder at the Conſtancy of thoſe Magiſtrates, whom the Neceſſity of ſpending Millions could not divert from ſtriving to carry off Waters upon a very long Tract of Ground, where the Want of Declivity infected the Air, and ſeemed to bar all Hopes of Remedy. He is grateful for a Favour which is not deſigned for him, whilſt the Inhabitants of the Places enjoy it without deſigning to take Notice of it. All the Branches of his Knowledge increaſe, and, as it were, gather as he advances.

In order to render the Expeditions of my Traveller no leſs beneficial than amuſing, I have required of him a previous Stock of Experiments and Mechanics: But it was not from any Thought of making him a Naturaliſt. I alſo deſired him to be tollerably well verſed in Matters of Commerce: But yet I aim not at making a Merchant of him. It is a fine thing to be a Merchant, or a Naturaliſt; but I intend to bring my Traveller to ſomething better.

To know Things nobly.

He muſt, in his Travels, render the Objects of natural Knowledge and Commerce as familiar to himſelf as the Operations of the Trades that furniſh his Apartment or accouter his Horſe. He does not ſet up for an Upholſterer, a Sadler, or an Ironmonger. He knows indeed what belongs to theſe Profeſſions, but he knows it without any Paſſion or Emulation. You will not hear him decrying every thing, nor affecting the Part of a Reformer, at ſeeing a Foreſt-work Suit of Hangings of *Anbuſſon* matched with one of *Beauvais*; nor eagerly aſk for a tanned Leather, when one of an inferior Dreſſing will do. A judicious Traveller likewiſe ſhews an infinite Dignity, when he converſes with equal Coolneſs; I had almoſt ſaid with the ſame Indifference, upon what is conſtantly experienced in Nature, or daily practiſed in Society. He is every where liſtened to; becauſe the Dictates of Experience have a Charm for every Ear. If any uſeful Matter, which requires that no Miſtake ſhould be committed, happens to be the Topick of Converſation, each Converſant is for telling his Sentiment. The prudent Traveller lets them all get the ſtart of him; he at laſt calmly mentions what he has ſeen; and the whole Company comes over to his Opinion. At his return Home he will be a Judge there, and a very competent Judge too, of whatever has a Relation to Experiments, Mechanics, and the Fabrick of all the Matters of Tranſportation. If the Pavement of a Highway is to be rendered firm, or Waters to be conveyed without Loſs, or the Inconveniencies of a Fire-Engine to be remedied, or the Benefit of a Salt-houſe to be increaſed by facilitating the Evaporation of the Water and the Sinking of the Salt; if, in ſhort, ſome Eſtabliſhment is intended that concerns whole Families, or even the Public; they will have Recourſe to the Advice of the Man, who, after having learned the Grounds and Principles of theſe Things, has left his Country purpoſely to obtain the Practice of them, by ſtaying ſome Time in every Place where he found Queſtions to be aſked, or Inſtructions to be got. In Deliberations concerning Works of this Nature, how contemptible will that Man appear who has ſeen nothing; or whoſe Ramblings all the World over have enabled him only to tell you what he has obſerved of the *Venus* of *Medicis*, or to play on the Bag-pipe after the *Italian* Gout? No Efforts or Excurſions are neceſſary to make a Fop or a Debauchee. We are but too well provided at Home with what will turn his Brains, or corrupt his Heart. But a Man muſt needs have travelled; he muſt have ſeen much, and after the beſt Manner, to acquire the Reputation of having an excellent Head. Experience alone entitles us to bring down the Promiſes and Self-ſufficiency of a certain Set of Genii, who fancy they will find every thing in the Solitude of their Cabinet, or by the Acquiſition of a few mathematical Truths, and who imagine their Projects will not meet with more Oppoſition in Society, or in Nature, than the Lines of their Geometry on Paper.

Suppoſing it a laudable Thing to look out for Means of making one's Way through the World, the Method I have propoſed is the plaineſt and the moſt direct to get acquainted with the real Exigencies of Society, and the true Intereſts of Princes. But, I content myſelf with only gaining the End I had at firſt in View, to render my Traveller amiable and uſeful to Mankind. This Point once obtained, it is no matter to him whether he is conſulted by his Family, his Country, or his Prince: His chief Satisfaction conſiſts in procuring the common Good rather than his own Advancement. Referring every thing to one's ſelf, ſo as never to take any Share in an Enterpriſe but in Proportion as it favours our perſonal Intereſt, has always ſomething mean it. I required nobler Views of my Traveller, becauſe it is a Gentleman, or a true Patriot I am ſending abroad.

This Diſcourſe was thought by the Company to have been ended too ſoon. 'Tis a Pity, ſaid the Gentleman to the Merchant, that you have been ſo conciſe upon the Subject. However, you have touched every material Point. Nothing has done me more Pleaſure, next to the Means you propoſe for the forming of a young Gentleman, than the Nobleneſs of the Sentiments you inſpire him with. You ſhew the Elevation of a great Man's Mind in all your Views: nor do I wonder at it: But, will you not be ſurprized to ſee me ſo far the Partiſan of Commerce, as to have choſen it for the Employment of my third Son;

It is chiefly with that View that I make him travel: I have provided no other Stock of Sciences for him, than to make him learn Mechanics, the uſual Phyſics, and the Matter or principal Objects of Commerce. He has been trained up in them, as well as in the Practice of the *Latin* and *French* Tongues. If he has a Mind to add to them the *Italian* and the *Engliſh*, he muſt give me Leave not to let him learn them any where but in the countries themſelves where theſe Languages are ſpoken.

As you need not make any Apologies, for having, in giving me your good advice, acted the Part of a Man nobly born, I ſhall eaſily juſtify my having thought like a good Merchant.

Nothing was more wiſely eſtabliſhed than the Bounds which ſeparate Noblemen from Perſons in an inferior Rank. This Precaution maintains in the Gentleman the Sentiments that will hinder him from acting beneath himſelf, and fires the rich Citizen with an Emulation capable of raiſing him to the nobleſt Attempts. It is with Juſtice that the Tranſition from one of theſe Conditions to the other has been rendered difficult. The Man who is willing to force that Barrier, and attain a higher Rank, muſt give Proofs of either an uncommon Bravery, or of ſuch extenſive Talents as will make him the Man of the Republic. On the other Hand, the Gentleman who would fain give over his Prerogatives, to ruſh into the Crowd, and take to the manual Operations of the common Claſs of Men, is checked from it by the Fear of diſparaging and bringing Reproaches upon himſelf. The reſpective Difficulties keep them both in their proper State, and commonly procure us uſeful Men in all the Stages of Society.

But there is one Point in which the Condition of the Tradeſman is more agreeable than the Gentleman's. The former, who knows the Way to Glory and Titles, may very juſtly, and without any Controul, forbear ingaging in it. Nay, he is never blamed for keeping within the Bounds of the moſt indifferent Condition. His Aſſiduity in multiplying daily Profits will, perhaps, be the greateſt Encomium that can be made of him. 'Tis not the ſame Thing with the Gentleman. Nor is it even enough for him not to degrade himſelf by manual Gains, and by Works which all the World is capable of: He muſt diſtinguiſh and bear himſelf up by that very Activity which has been the Principle of his Nobility. It happens, indeed, but too often that he knows not ſufficiently the Methods that will extricate him out of his State of Inutility, and ſave him from the ordinary Puniſhment annexed to it, to be buried in Oblivion. Being ſeduced by frivolous Diſcourſes, which have been repeated to him over and over from his Infancy, he fancies that the bearing of Arms and Military Service are the only Things that can give him Employment. Whence it frequently happens, that the End of the War, and his own Diſguſt for the Service, throw him and his Family into the moſt deplorable Obſcurity. There are numberleſs Inſtances of this in Families formerly very eminent; eſpecially in ſuch of our Provinces where the equal ſharing of Patrimonies cuts the fineſt Eſtates into ſo many Portions, that after a few Generations and new Sub-diviſions, they perfectly dwindle into nothing. A Gentleman in that Caſe dreads above all things Military Service, which he looks upon as a ſure Means of compleating his Ruin. How many Families have been thus undone and loſt to the State! They entertain a confuſed ill-grounded Notion that the State is able and obliged to ſecure Funds for, or make Advances to every Gentleman reduced to Neceſſity: They launch out into Complaints: They accuſe the preſent Age, the Court, the Miniſters, the King himſelf. They talk ridiculouſly. The King cannot multiply the Overplus of his Expence into a hundred Millions, which would be annually inſufficient to ſatisfy theſe Expoſtulators. But Commerce and Talents will ſupply them with a thouſand Means of promoting their Children, and reſtoring their Families to their former Splendor and Luſtre.

Nor do I ſpeak here of the current Management of their Eſtates, any more than of the Sale of the Product of their Flocks, Woods and Lands. Cares like theſe were never a Diſgrace to any one. Thoſe who ſcorn to take them are, on the contrary, moſt commonly puniſhed for it by a very mortifying Decay: And no greater Air of Wealth, nor any more honourable Expence can be ſeen any where than in the Families of the Lords who are the Managers of their own Lands. Being born a Gentleman is being born to command, and be at the Head of both Men and great Enterprizes. But what Sort of Government will that Man dare to take upon him, who leaves in Diſorder what makes the firſt Subſiſtance of him and his Family?

The King, the Laws, and the univerſal Practice, ſtill offer him other Means of ſettling his Affairs in an honourable Manner. If he is in Caſh, he may, inſtead of ſquandring or letting his Stock lie idle, take a Share in the Management of Woods, in Shipping, in Society *en Commandite* (a), or in ſome ſecret Partnerſhip at the opening of a Sale of foreign or other Goods: He ſhares the Direction, the Charges and the Profit. Nothing of all that is known, and were it done openly, he would have no Reaſon to bluſh for it any more than having ſold the Product of his own Ozier-plot or his Ponds.

(a) *An Enterprize of Commerce between ſeveral Partners ſome of whom lend their Money without performing any Function in the Undertaking.*

Falling into Miſery, for want of timely and willingly laying hold of the Means of Relief which offer, is the only Thing that covers him with Shame.

But, ſaying that commerce has nothing unlawful or diſhonourable in it for a Gentleman, is making a very ſcanty Encomium of it. I dare ſay he will find in it the ſureſt Means of enobling his youngeſt Sons, or of reſtoring to the brighteſt Light a great Name which had been obſcured by poverty or Ruin.

What is the true origin of the Splendor and Honours which attend the Condition of Noblemen? Is it not the juſt and well-grounded Perſuaſion of their being born to promote the public Good? 'Tis indeed in that View that new Honours and new Rewards are beſtowed upon the Man who has preſerved a Town, a Body of Troops, a Corporation, or the Life of a ſingle Citizen dear to his Country. It is Prudence and Activity that raiſe a Man out of the common Claſs, when his Virtues have been exerted for the Good of the State. For Scorn attends the braveſt Man who is only a Pyrate or a Dueliſt. What Regard ought we not then to entertain for a Gentleman, who, with Capacity, attempts the Eſtabliſhment of an advantageous Colony, or the Advancement of thoſe in a languiſhing Condition? Deſtitute as we now begin to be of large Timber for Ship-building what Gratitude ſhould we not be bound to have for one who would make it his Taſk to carry to *Louiſiana* a ſufficient Number of either Vagabonds or Voluntiers, there to work the lofty Woods which that Land is covered with, by ſtopping with Pile-work and Dykes the Inundations of the *Micisſipi*; or by building for us Ships upon the Spot; or, in ſhort, by yearly ballaſting with a Number of the fineſt Oaks the Ships that ſhould be ſent thither from the Stocks of *Breſt* or *Rochefort!* What Value does not the State experſs for the Man, who, at the Approach of a great Scarcity of Corn, embarks with all haſte with one or more Ships, and timely brings back from the Ports of *Dantzic* and *London*, or from the Coaſt of *Barbary*, a firſt Proviſion of Corn, which he prudently cauſes to be followed by ſtill more abundant Supplies! However, it is not neceſſary, in order to render himſelf agreeable to the Public, that a Man ſhould have cut Armies to Pieces, or given Bread to the whole State.

Has he not nouriſhed Multitudes, and preſerved whole Provinces from endleſs Calamities, when he has, by Advances of Money, or by a wiſe Management, eſtabliſhed or maintained three Studs of Horſes, that will help the Operations of Huſbandry, and remount the Cavalry; or great Forges, of an acknowledged Benefit; or large Manufactures, or Plantations of Wood in uſeleſs Grounds; or Plantations of Madder, of Woad, of Fouic, of Geneſtrol, of greening Weed, of white Mulberry-trees; or any other ſuch Works, that will ſupply a Multitude of Families with Employment, and feed a great many others, whom Agriculture alone could ſufficiently maintain?

Let us caſt our Eyes upon the Caſtle of St. *Gobin* (*a*), formerly a heap of Ruins, a paltry decay'd country Houſe. It employs now above five hundred Workmen within it Walls, and gives Subſiſtance without, to five hundred Families of the adjacent Places, by ſupplying them with Work, or by buying their Commodities. Not to mention the Money which that Manufacture brings us from foreign Countries.

Poſſibly a Knight-Errant will, with Indignation, ſee the Abodes of the ancient Worthies employed for manual Works. The low People of the Neighbourhood, obliged to buy Wood ſomewhat dearer than before, will, perhaps, curſe an eſtabliſhment which is the real Proſperity of that Country. But, can Judgments like theſe bear Examination; Publick Good ought to be the Rule of our Eſteem, as it is the Foundation of true Nobility.

Lewis XIV thought it ſo, when coming from the End of the *Low Countries* to the Aſſiſtance of *Alſace*, which was now ſeized upon, he went ſeveral Leagues out of his Road purpoſely to honour with his Viſit the Works of St. *Gobin*, of which he would have the particular Account given him.

Lewis XV was of the ſame Opinion, when he granted the fineſt Prerogatives, and the moſt advantageous Diſtinctions to the Eſtabliſhers of the Manufactures of *Abbeville* and *Sedan*. I omit many others. It was not in hopes that the Deſcendants of Meſſiuers *Cadeau* and *Van*

(*a*) *Manufacture of run and blown Glaſſes: betwixt* Laon, la Fere, *and* Chauny.

Robais ſhould beſtow their Stocks to buy ſome indolent Poſt, and at laſt live nobly by living idly; but rather on Condition that theſe Families would continue to maintain thereby an Activity truly uſeful to the State; by multiplying uſeful Correſpondencies with foreign Countries, and by procuring a Livelihood to thouſands of Citizens. The Manufacture of *Abbeville* does alone employ above two thouſand five hundred, within the Space of a thouſand ſquare Feet, and imparts its Plenty to all Places round about.

Our *French* are now ſo far from taking any Fancy to *Engliſh* or *Dutch* Stuffs, or from ſending their Money to *London* to have a Pendulum Clock, that our Chamber and Pocket Clock-work is the only one now in uſe among us; and much valued by Strangers themſelves, both for its Exactneſs and Neatneſs. Our Woollen Cloth and ſmall Stuffs are of very common Uſe at *Milan*, *Lisbon* and *Cadiz*, in all the *Levant*, and eſpecially in the *French* and *Spaniſh* Colonies. Now I would aſk, if a Gentleman will do leſs Good and Honour to *France*, by making an Army of Workmen go in good Order, and by improving by his Obſervations a Machine much deſired, or a Stuff equivalent to the Product of the beſt Lands, than if he had defended a Poſt at War, or got together again the Remains of a Company diſperſed and put in Confuſion? It is eaſier to run two or three Riſks in one's Life, than to maintain by a ſtubborn unſhaken Vigilance, and to improve by new Experiments, a Colony, a Stud of Horſes, or any one of thoſe Employments that gives Bread to the Multitude.

Pray, conſider, on the one Hand, the narrow Views of a Gentleman's younger Son who is poor, and charged with the Management of a Poultry-yard, or the Villany of a Sharper who borrows or pilfers Money on all Sides to live: And, on the other, the Sagacity, the Gentility, the Elevation of Mind, and the whole liberal Carriage of a Gentleman, who accounts to himſelf in his Cloſet for the Product of a ſucceſsful Employment. He always appears with all the Decency ſuitable to him. Every body courts him: He gives Life and Shelter to all under his Protection. Which of theſe has degenerated? Doubtleſs the Gentleman who ruins himſelf by Gaming and Debauchery. But, on the other hand, how truly the Nobility of a *Rouſſeau* (*a*) or a *Julienne* (*b*) deſerves univerſal Reſpect! It is by ſerving the Publick that we may become dear to it. Thus it is, that our younger Children, inſtead of being a Weight upon their elder Brothers, might help to ſupport both them and their Siſters, and introduce into a Family, very often ſunk in Debts, the Aſſiſtance and Splendor of the moſt lawfully acquired Riches.

But it is not only our noble Families that would gain much, by having ſome Branch of the wholeſale Trade cultivated by their younger Brothers. The State itſelf would infallibly find, in this wiſe Practice, an endleſs Nurſery of excellent Men. A young Gentleman, inwardly urged on by his Birth, will leave no Stone unturned to keep out of the common Claſs, and will always make the moſt honourable Uſe of his Riches; by affording to the military Man, his Neighbour, the Aſſiſtance of a kind Advance of Money, or by decorating his Country with Embelliſhments of the utmoſt Utility. However, it is a known Matter of Fact, that great Enterprizes preceded by good Studies, and by Travels judiciouſly employed, are both the School and the Trial of all Talents.

I have another Thing to obſerve to you, concerning the Advantages and the Reſources of Commerce; *viz.* That noble Families, by ſcorning that kind of Commerce to which they are invited both by the King and State, deprive themſelves of the Occaſions of becoming dear to Mankind, and leave to Merchants the whole Advantage of the nobleſt Enterprizes. The Sentiments of Noblemen grow meaner and narrower with their Circumſtances; and it is natural, on the contrary, to ſee Merchants have the greateſt Views, and raiſe themſelves to the nobleſt Actions, in Proportion as their Knowledge and Wealth increaſe. This may be proved by both Reaſon and Example.

It would be needleſs to quote Inſtances of the firſt Kind. They are reckoned by Thouſands. As to the Merchant,

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(*a*) Mr. *Rouſſeau, Director of a large Manufacture of Woollen Cloth at* Sedan.

(*b*) *Mr. de Julienne, Director of the Manufacture of Woollen Cloth at the* Gobelins.

whom a laudable Induſtry has enabled to ſerve their Country, and at laſt to ſit on a Level with the Nobility; inſtead of quoting recent Facts known to every one; let us go higher up to remote Ages, and borrow our Examples from the great. It is with private Families as with whole Cities, and even Republics. The Spirit of Commerce becomes the Source of Induſtry and Opulence. Here we may recal the Degree of Splendor to which the Cities of *Tyre* and *Carthage* were raiſed by a Set of plain Merchants. As long as theſe Towns remained only trading Towns, they were active, happy and agreeable to the whole World. They committed a groſs Miſtake, and worked their own Ruin, when the Spirit of Conqueſts ſucceeded to the ſimple Deſire of Self preſervation. The Cities of *Genoa* and *Venice* have been raiſed only by Merchants, and the Diminution of their former Proſperity is barely the Decay of their Commerce, occaſioned by the Aggrandizement of that of the *Portugueze* in the *Indies*; by the Introduction of the *Engliſh* into the *Mediterranean*; I will add, and by the Pageantry of certain Families, who put too great a Diſtance between Nobility and Induſtry. So long as the Counts of *Flanders* careſſed and made much of the Workers of Woollen Stuffs, and the Undertakers of Manufuctures of Cloth and Camblets, nothing could be compared to the Wealth of the Cities of *Bruges* and *Ghent*. The Indifference, which was afterwards ſhewn for theſe Works, deſtroyed them, and threw both Towns, already reduced to the Product of their Lands, which were excellent, into a State of Mediocrity, from which they have never recovered. The Workmen, loaded with impoſitions and Inſults, carried their Woollen Cloth to *England* and *Antwerp*, where they introduced Wealth, to which thoſe Cities were yet Strangers; and to this Spirit of Traffick, which daily improved, are we to attribute the Grandeur and Magnificence of *London*. The face of *England* is totally changed, firſt, by the Fabrick of its Wool, and afterwards by the Multiplication of its Shipping. The entire Decay of *Antwerp* came from the Retiring of its Workmen to *Amſterdam*, and from the Suppreſſion of its Shipping, which it loſt together with its Harbour.

The City of *Hamburgh* being menaced, as well as all the Hans-Towns, with a quick Diſtruction of its Wealth, by the Neceſſity of ſharing the Commerce of the *Baltick* with many Nations, which had not been ſeen meddling with it before, has had the Skill to extend the ſeveral Branches of its Induſtry to other Seas, and recover its former Vigour.

Holland receives from and ſends Embaſſadors to crown'd Heads. It ranks with the moſt diſtinguiſhed States, and is behind none of them for the Plenty of both the neceſſary and the agreeable, for the Boldneſs of its Enterprizes and the Wiſdom of its Government. And what are the *Dutch* but a Set of Merchants, who take a Pride in being ſuch? Let us, according to the Deſires of certain ſyſtematical Men, bring them back to their primitive Condition. We ſhall find a Handful of Fiſhermen, of Cheeſemongers and Soldiers, groping in the Dirt of that Country, naturally unfit to be inhabited. But that Time is over; ſince the Spirit of Commerce has ſpread itſelf over that little Corner of the World, it has aſſumed another Face. The Waters have been carried off; The Grounds of their Inhabitants are daily raiſed, and rendered firmer and firmer. Their Towns become Models of Neatneſs and Conveniency: The Draining of the Lands has even brought in Gardening and Huſbandry. Add to this Multitudes of Inhabitants: An eager Emulation in all Arts; the moſt perfect Marine; and the grateſt Honours paid to the Art Military and refined Politics; all, in ſhort, has been introduced there with Commerce, which works the Preſervation and Glory of Families as well as of whole States. I would aſk now, if the Nobility can do greater Things, or ever be diſparaged by Operations of this Kind?

I ſhall add but two more Inſtances of the grand Views inſpired by Commerce and Experience. The firſt is that of *James Cœur*, a Merchant of the city of *Bourges*, who had alone a more extenſive Commerce than all the Merchants of *France* had together in his Time, and by his wiſe Counſels, as well as by the Certainty of his Caſh, humbled the houſe of *Burgundy*, inſured the Crown of *France* to the lawful Heir *Charles* VII, and by him to the Branches of *Valois* and *Bourbon* his Succeſſors.

The other Inſtance is that of the Merchants of St. *Malo*, who being exaſperated by the unjuſt Requeſt which the

Congreſs of *Gertruidemberg* made to *Lewis* XIV. of employing his Troops to force his Grandſon, *Philip* V. to abandon the Crown of *Spain*, to which the Will of *Charles* I. had called him; joined the Profits they had juſt made in the Commerce of the *Spaniſh* Colonies in *America*, and brought thirty-two Millions in Gold to the Foot of the Throne, at a Time when the Finances had been exhauſted by a long Series of unhappy Events. Theſe thirty-two Millions, timely diſtributed in the Mints of *France*, re-animated the War and all Payments. The Houſe now reigning in the Kingdoms of *France*, *Spain*, and *Naples*, will never forget the Agitation it was in at that Time, and the happy Means of maintaining its Rights found in that Criſis, in the Zeal of thoſe Merchants. If Tradeſmen have made ſo noble a Uſe of their Riches, what Helps ought not the State to expect, when Treaſures ſhall be owing to the Care and Ingenuity of Gentlemen? The King and the Commonwealth, on the contrary, have no Sentiments, nor any Service to expect from one who thinks his Idleneſs a Means to keep his Nobility; juſt as the Church has nothing to hope from a beneficed Man, who argues upon and weighs the Merit of an Actreſs, or grounds upon Principles the beſt Manner of patching a Face.

Pleaſures, Amuſements, and Idleneſs may, among a certain Set of People, aſſume an Outſide of Nobility. But Men, who are as good Citizens as they are truly noble, have a very different Way of thinking. The Habit of doing nothing has no other Efficacy but that of adulterating our Sentiments; and the State is no leſs grateful for the Service of Ingenuity and Prudence, than for thoſe of Courage and Intrepidity. In ſhort, it is the Preſervation of the State which conſtitutes our Glory.

I know my own Way of thinking, and how to ſet Bounds to my own Deſires. But I ſhould think myſelf equally happy as a Father, if my Advices had rendered my eldeſt Son a *Turenne*, and made a *James Cœur* of the youngeſt.

DIALOGUE XXVI.

POLITICS,

OR,

The Government of NATIONS.

ALL the Arts and Profeſſions which we have been viewing hitherto, as well as thoſe which are not within our Reach, are ſo many Branches of the Government exerted by Man from one End of the World to the other. The Dexterity which he acquires in his different Trials, enables him to give Woods and Stones, Metals and Earth, whatever Turn he pleaſes. He makes Cotton, Wool, Flax, and Silk, aſſume a thouſand different Forms. The hardeſt Matters and the moſt fugitive Elements yield to him, and the Operations of Fire itſelf are directed by his Laws. There is nothing around him, but what he exerts his Induſtry upon, nothing but what he ſoon or late ſubjects to his Sway. The Senſe he has of his Dominion and Privileges is ſo very quick, that he never fails to wonder at ſeeing ſome Productions of Nature which he has not turned to his own Uſe. He comforts himſelf, in that Caſe, from the Conſideration, that the Animals, who ſerve him, have the Benefit of it; otherwiſe, he looks upon the Inutility of the Thing as an Accuſation of Ignorance and Idleneſs, that diſgraces him. How could he neglect making uſe of what he has in his Eye, and at his Hand; he that has the ſkill to ſeize upon inviſible Objects? He finds Means to lay hold of the Wind itſelf. He gathers it at large in a common Reſſervoir, and by the judicious Diſtribution he makes of it through the ſeveral Pipes of the Organ, he fetches, from the Cavity of a mute Trunk, the compleateſt Harmony, and even many of the Characteriſtics of the human Voice. Nay, more: The very Strength of the Air becomes his own; by oppoſing Surfaces to its direct Courſe, he daily applies it to his Uſe, to grind his Corn, to raiſe his Water, or even to tranſport himſelf any where, within the nine thouſand Leagues of Circumference which encompaſs his Habitation every way. Thus he is, in whatever he produces or directs, the Image of the Creator and Preſerver of the Univerſe, as he never ceaſes to invent, to maintain, to reproduce, and to govern.

But, Man, who governs all, needs to be governed himſelf. And as there is nothing, next to Crimes, that degrades Man more than Indolence and Idleneſs; there is nothing, next to Virtue, that brings him nearer his divine Model, than the great Art of leading Nations, of governing Minds, of preſerving Bodies, and of making Talents as well as Riches contribute to the common Benefit.

The Men, whom we have hitherto conſidered, are only private Men, who have among themſelves no other than greater or leſs Relations of Utility; but exert no kind of Authority over their Fellow-Creatures. They aſſiſt, but do not govern them. Here follows a new Claſs of Men, new Diſpoſitions, and quite other Stations, which alter the Scene entirely. Thoſe who fill them are public Men, charged (by whom or by what Title I do not as yet examine) with ſeveral honourable Functions, that raiſe them above the Multitude, which is with Regard to them in a State of Dependance greater or leſs, according to the Extent of their Power, or the Superiority of their Genius.

The Barriſter. The Lawyer, or any other Orator, who ſpeaks to ſet the Prerogatives and Rights of other men in a clear Light, exerts the leaſt of Powers. He has no other Right but that of being liſtened to. Nobody is bound to adhere to his Thoughts, but in Proportion as he thinks it his Duty, or when he has willingly promiſed his Aſſent to them. He is attended with no Apparitor, and has no Means of Compulſion to make himſelf be obeyed. But the Art, by which he inſinuates himſelf into Men's Minds, renders him Maſter of them by Degrees, and procures him the moſt engaging of all Authorities, *viz.* that of Perſuaſion.

The Beauties of Eloquence, Learning, and Diſcernment, procure the Orator a great Name, and prepare a Conqueſt for him. But theſe Talents make him ſure of the Victory before-hand, if he is but a virtuous Man, and as incapable of pleading in a bad Cauſe, as he is able by his Sagacity to find out the Injuſtice of it, and ſet it in the brighteſt Light.

This fine Genius, after having faithfully vindicated Truth and Juſtice, retires into the Crowd again. He is but what the others are. The outward Expreſſions of the moſt profound Reſpect, and ceremonial Preparations are not for him. But, whenever he comes in or paſſes by, every one ſays to his Neighbour, *Here he is.* Thoſe. who have not been able to hear him, are glad to have ſeen him. He is ſenſible of the whole Danger of this general Effuſion of Eſteem and Love. But the ſame Virtue, which has devoted his Talents to the Service of Truth, preſerves him from a preſumptuous over-bearing Behaviour. She alone can, by ſuppreſſing all Arts of Conceit, and by ſhewing him the real Bounds of his Knowledge, inſure him Praiſes of the pureſt Kind, and without any Mixture of Reproach. He knows that Self-ſufficiency does no more beſpeak an ingenious Man, than Modeſty commonly does a Quack.

The Phyſician.

The high Degree of Eſteem, to which we raiſe the great Orator, is at once grounded upon his real Merit, and our actual Want of Experience to diſplay and explain our own Rights. It is the ſame with the Power we give over our Bodies to the learned Phyſician, and with the honourable Rank he has in Society. He is no leſs indebted for it to his own Capacity than to the Deſire we have to live. Were I to ſpeak here of the Order of Sciences, Phyſic ſhould have a Rank among them as well as Eloquence. But, my only Deſign being to mention the ſeveral Degrees of Power which have been granted to Man over his Fellow-Creatures, I ought not here to exclude the Phyſician, who exerts ſo real and ſo important an Authority over our Life. Satyriſts have often affected to find in private Men certain Defects, from which they have drawn general Concluſions with a viſible Deſign to diſcredit Phyſic itſelf. But, if this Way of Proceeding is authorized, there is no Science, or Profeſſion, but what is expoſed to the ſame Inſults: The good Phyſician, however, is ſo little uneaſy about it, that he is the warmeſt Exploder of exceſſive Pretenſions and frivolous Practices. You never find him eager to defend himſelf. Nay, he receives the Jeſt on his Profeſſion with that graceful Security which reſults from Experience: And it is that very Diſpoſition of his which diſarms all Banterers. He is not ignorant of Man's Condition, any more than of the Extent of his own Knowledge. It is a great Point gained when he knows the human Body as a good Pilot knows the Sea. The Experience and Activity of both are of vaſt Benefit to Society, and ſpare many an Accident to private Perſons. But, they neither can preſerve us from hidden Rocks, nor free us from Storms; and we ought no more to complain againſt the narrow Compaſs of the Science of either the Pilot or the Phyſician, than againſt the Law which has rendered the Enjoyment of earthly Riches ſo uncertain to us, and ſo much limited the Duration of Man's Life.

The Authority of the Phyſician reſembles the *Roman* Dictatorſhip: He is made abſolute Maſter of every thing, ſo long as the Danger laſts: But it is no ſooner over than his Functions are at an End. Far from claiming any further Authority over our Health, he never thinks himſelf a great Phyſician but in Proportion as he accuſtoms the Body to do without Phyſic, to reſume the common Operations, and to be fit for any Thing. He knows better than any Man, how dangerous it is to pretend to govern by extraordinary Methods, and by *Ratiocination*, what the Author of Nature has ſo wiſely abandoned to the ſpeedy Direction of our Senſes and of common Experience.

What cauſes the Joy and Gratitude of Families, is not the only Obligation we have to Phyſicians. They have done a World of Good to Society and Religion, by the Progreſs for which the Sciences are moſt peculiarly indebted to them. There are few among the Learned that know better, or that have ſo much improved our Situation in this World, as the Phyſicians of the laſt Age. They have, with great Reaſon, looked upon natural Hiſtory as our true Patrimony, and their own ſpecial Province. Is there any Corner of our Globe which they have not ſearched with an attentive Eye, to inſure to Man ſome new Tribute from it? Tho' more eſpecially buſy about collecting what might aſſiſt our Nouriſhment or Health, they have informed us alſo of many other uſeful Things which they met in their Way, and there is hardly any Art or Trade to which they have not made ſome Preſent. With this Curioſity ſo eſtimable, and ſo common among them, they, very luckily both for us and themſelves, are diſperſed all the World over, and always at Hand to view every Thing. The frequent Travels they undertake, at the Requeſt of private Perſons who call upon them for Help, often become uſeful either to the Country, by the Obſervation of ſome local Advantage not yet perceived there, or to Sciences, by the Diſcovery of what had eſcaped the general Notice. Their perpetual Converſe with the World, and the conſtant Sight of human Miſeries, moſt commonly render them polite and compaſſionate. They delight in introducing almoſt every-where an Eccleſiaſtic, an Hoſpital Woman, an intelligent Servant, well verſed in the Knowledge of common Things, to facilitate the Communication of all Aſſiſtance. Nothing is more engaging than a good Phyſician; he ſeems made for the Happineſs of Society; and after he has with much Toil ſerved the Public, you will ſee the Warrior and the Man of Letters equally overjoyed at his coming to enjoy himſelf in their Company. Where is it young Men are not invited to cultivate Sciences by the Advice or Reputation of a good Phyſician? No-body is ignorant of the ineſtimable Service our Phyſicians have done us, by cauſing the Study of the *Greek* Tongue, the Uſe of good *Latin*, and experimental Phyſics to flouriſh among us. Caſt your Eyes upon the Indexes of the Memoirs of our moſt illuſtrious Academies in *Italy*, *Switzerland*, *Germany*, *Holland*, *England* and *France*, you will ſee commonly the Names of Phyſicians and Surgeons in the Titles of the fineſt Works of all Kinds, and of the fineſt Diſcoveries in Point of Phyſics.

I will not divide theſe two Profeſſions: One of them is but a Diſmembering of the other. They have ſettled their reſpective Provinces merely to procure us ſurer Services: And it is no leſs their Glory than their Intereſt to remain inviolably united.

The Power exerted over us by the Lawyer and the Phyſician is equally voluntary on our Part. Let us now paſs on to Conditions, that bear a real Sway over, and maſter us in a great many Things, and which the Exigencies of Society have rendered of abſolute Neceſſity.

The Magiſtrate. The ſeveral Degrees of Magiſtracy begin to ſet Man both in a greater Light, and a higher Rank. A Judge may ſhew all the Talents of the Orator in the Reports he makes to a Corporation, as well as in his moving or voting. His ſpeaking with leſs Emotion than the Barriſter, is intended not only to preſerve a greater Dignity, but alſo to be able to give his Judgment in a cooler Manner. He is expected to be as incorruptible and as free from Paſſion as the Laws themſelves. A happy Diſpoſition this, that will ever check the too flattering Thought of ſharing the ſupreme Power. That Judge, who aſcends the Tribunal, is now going, by pronouncing a Sentence of five or ſix Lines, or by barely adding his Vote to thoſe of many others, to decide the Fate of ſeveral Families: He is now about to act peremptorily in an Affair which has puzzled the greateſt Genius's, and in a Moment to demoliſh the moſt brilliant Fortune; or, perhaps, to diſpoſe of the Life of his Fellow Citizen. The Importance of his Poſt makes him tremble himſelf; and the Habit of inveſtigating very nice or intricate Intereſts, give him an Air of Sedateneſs and Recollection, which become him as well as Expedition and Activity become the Soldier. He ceaſes heſitating, the Minute his Reſolution is taken; but he never takes it haſtily. Very often he ſhall have but one word to ſay; and it is only after long Diſcuſſions, after the deepeſt Studies and Reflections, that he dares pronounce the Word.

Let us conſider, at one View, the Life of our excellent Judges. We have many of that Kind; nor are their Occupations a Secret to us. Theſe laborious Men are often obliged to throw off the Care of their own Affairs upon others, in order to give themſelves over to ours. A free Acceſs to their Study is refuſed to Nobody; becauſe Solicitations, which they permit rather out of Patience than from any ſecret Pleaſure, have often procured them uſeful Inſights into the Matter; and they generally terminate more Affairs as Arbitrators or Friends, than in their Quality of Judges.

But what are the Alleviations of ſo conſtant a Labour? I really know none. The moſt agreeable Studies are, in a Manner, prohibited to them. An inborn Curioſity, and a Taſte refined by a liberal Education, very often call them that Way. But the moſt lawful Amuſements, the ſhorteſt Leiſure, the leaſt Refreſhment, they are cruelly deprived of. Sometimes by the Multiplicity of urgent Buſineſs, ſometimes by an endleſs Formality: And when they think they are going to breathe a little from their indiſpenſable Toils, there come upon them public Diſcourſes to be made at the coming in of Terms, ceremonial Speeches, and a Crowd of Letters and Compliments, ſtill more burthenſome to them than the Affairs themſelves.

'Tis true, they wear very diſtinguiſhed Robes; they ſit in the higheſt Places, and are honoured by the Public. But, does ſuch a Reward bear any Kind of Proportion to ſo much Confinement and Attention of Mind? Is it the Magiſtrates we ought to think happy in labouring for the Public, or ought we rather to congratulate the latter for having ſuch indefatigable Judges? I ſhall readily anſwer this Queſtion, though in a Manner not naturally to be expected. The greateſt Advantage is ſtill on their Side. I muſt confeſs they inſure our Tranquility by totally renouncing their own. But they are encouraged by far greater Motives than we. It belongs to generous Minds, that have a tranſcendent Magnanimity, to reliſh, in its full Extent, all the Delicacy of the Pleaſure which muſt be felt in puniſhing Injuſtice, in reſtoring oppreſſed Families to their former Eaſe, and in maintaining the Tranquility of Society in general.

Military Men.

This Pleaſure, which is the Ground of real Honour, and the Incentive of Acts of Nobility, ſeems ſtill keener in thoſe who maintain the Security of the State without. It is viſibly their moſt active and moſt predominant Paſſion: And if it does not abſorb all their other Sentiments, it maſters them at leaſt, and keeps them in Awe. A Warrior bids adieu to every Thing dear to him. He overlooks his Reſt, Pleaſures, and Intereſt, to run after Glory. He pities thoſe who ſhun Danger, and thinks himſelf happy to be employed preferably to another, either in the Heat of an Action, or in ſome hazardous Commiſſion. It was from a Suppoſition of this Principle and Inclination in all martial Hearts, that the Viſcount of *Turenne* ſaved, by an officious Falſhood, the Fortune of the Count *de Grandpré*, * who was aftterwards Marſhal of *Joyeuſe*, and inſpired him with Sentiments ſuitable to his Birth. The Viſcount had truſted him with the Eſcorte of a Convoy of Ammunition that was going to *Lens*. Young *Joyeuſe*, being ſtopped at *Arras* by a *Partie de Plaiſir*, left the Convoy under the Command of the Major of his Regiment, who being attacked, repulſed the Enemy, and arrived at *Lens* without Loſs. The Officers finding Fault with his having been abſent; how I pity Count *de Grandpré*, ſaid Marſhal *de Turenne* to them, to have been detained at *Arras* by my Order on ſuch a fine Occaſion! He never will pardon me.

All the Thoughts of the Military Man center in one ſingle Object. He has ever the ſame Proſpect in View; *viz. Honour:* But, what is Honour? Can a Definition of it be given?

Honour is the Applauſe we receive from our own Conſcience and the Public, in whatever we undertake for the public Good, at the Peril both of our Reſt and Life.

Courage, which is the moſt common Object of theſe Applauſes, does not always obtain them. It may be a meer Sally of the Blood, or even a brutiſh Tranſport more worthy our Deteſtation than our Praiſe. Honour never becomes the Reward of Courage, but when it has our Duty for its Rule, and is practiſed from the Love of Society.

Man comes into the World unarmed, becauſe he is intended to live innocently and quietly there. If his Paſſions have croſſed this Deſign of the Creator; if Injuſtice has perverted his Nature and rendered him a Tyger to his Fellow-Creatures; of courſe, the Fear of Oppreſſion renders the wearing of Arms neceſſary. But, on the other Hand, if the whole human Species is in Arms, it will not differ from a Multitude of wild Animals with Claws,

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* Turenne's Life, by Ramſai.

Clutches and Teeth. Self Intereſt and Violence will put every Thing into Confuſion. The ſame Neceſſity which obliges a Number of Families to admit a King, from whom the common Œconomy and Preſervation of the Confederates may ſpring, obliges them of courſe never to wear the Sword, but after they have received it from his Hands, and never to uſe it but conformably to his Laws, and for the maintaining of the public Good. Any other Uſe of our Forces ſets us on a Level with the Wolf and the Bear, who are in the World only for themſelves.

There is then falſe and true Honour. Falſe Honour is the Illuſion of Brutality, which, in ſpite of our being under Government, dares to diſpoſe of both our own Life and that of others. Falſe Honour exalts illegal Actions; Actions which we are obliged to truſt to Solitude and Darkneſs, becauſe the Laws, Conſcience, and Society are all againſt them. True Honour, on the contrary, is liable to no Reproach or Contradition: It is as pure and bright as the Sunſhine in which it appears. It needs have Recourſe to no Precaution or Artifice, becauſe it approves of none but Actions that never fear the Light. For which Reaſon it highly deſerves being courted by Men truly valiant. Falſe Honour is meer Smoke, a meer Seduction. It is as great a Murderer as Fanaticiſm: Nor would it be any great Taſk to make a compleat Parallel of them. Woe to him who is deluded by, and becomes a Slave to it. But, is true Honour any how different from the Voice of God, who ſecretly rewards us by the inward Satisfaction of having done our Duty with Courage? Is it outwardly any Thing elſe than the public Certificate and Acknowledgment of the beſt Action a Man can poſſibly do, *viz.* of his having loved Mankind ſo far as to ſacrifice himſelf for it? This generous Diſpoſition is that which comes neareſt to Charity, and would to God they were always intimately mixt, ſo as never to make but one and the ſame Virtue!

Honour, that Bleſſing ſo eagerly ſought for by thoſe who make a peculiar Profeſſion of Courage and active Services, is not then a frivolous Advantage, any more than an empty Notion: It is a very judicious Diſcernment, which the Public never failed to make, between the Intention of the Heart, and the Influences of meer

Temper, or the bodily Inſtruments which may lead their Miniſtry ſometimes to the indulging of Self-Love, ſometimes to the Practice of Virtue. See a Lion, a Duelliſt, a Robber, and every Man wholly centered within, or refering every Thing to himſelf; what Sentiments will arm them all, and lead them to the Enemy? Self-Love, Rage, a Reliſh for Bloodſhed. On the other Hand, what Sentiments have led into the Plains of *Ivry* and *Arques*, and the Fields of *Fribourg* and *Fontenoy*, the two mildeſt Mortals, the two lovelieſt Kings in the World? *Henry* IV. was challenging his own Patrimony, and the Liberty of his Eſtate made a Captive to fabulous Pretenſions. *Lewis* XV. yielded, though late and moſt unwillingly, to the unanimous Clamours of his Marines harraſſed out, and the whole Nation inſulted every where; he yielded to the Inſtances of his Allies for the lawful maintaining of their Rights.

That Glory, which is fond of procuring, or which has at leaſt a Regard for the Good of others, is without Doubt the nobleſt and moſt uſeful of all Paſſions. We cannot but rejoice at the Endeavours of our noble Families to inculcate it early in their Children. The Inſtructions given them on that Head will always be judicious and ſucceſsful, ſo long as they will give them to underſtand, that they never can be above other Men, but in Proportion as they ſhall have obliged and ſerved them.

Every Thing around them contributes to give them the higheſt Notion of Glory, and of the Services expected from them. This Notion is cheriſhed in their Hearts by honourable Diſtinctions, by Favours and Prerogatives, in ſhort, by a hearty Attachment of all the Public to that true Nobility which conſecrates them chiefly to the Defence of the State. The Children of Noblemen are ſeen without Jealouſy. Wherever they appear they ſee in us Expreſſions of Reſpect and Gratitude. We love to ſee the Deſcendants of great Stateſmen, and chiefly thoſe of our antient Deliverers. We are perſuaded beforehand, that they will be our Defenders in their Turn. Their Titles and Blazons are familiar to us. Nothing ſounds ſweeter to our Ears than the Names of *Montmorenci*, of *Chatillon ſur Marne*, of *Biron*, or of *Hartcourt*. The Blemiſhes that have obſcured ſome of theſe Names are perſonal; whilſt the Glory of the Services is an hereditary Advantage to their Poſterity. We call to our Remembrance the Proſperity of our Arms in *Italy* under the Conduct of *Coſſé Briſſac*, the declining of the League, which was ſtagger'd by the Dexterity of Marſhal *de Matignon*, *Auſtria* humbled by the Viſcount of *Turenne*, or any other ſuch Stroke of our Hiſtory, whenever they ſhew us in their Walks the young Lords who ſtill go by theſe beloved Names. What Tokens of Affection and Eſteem did not the Public give ſome Years ago to that young Student of the College of *Beauvais*, who eight or ten Months after he had interpreted the three Poems of *Homer* and *Virgil*, did, with the ſame Elegance and Spirit, tranſlate all the Lives of the great Men, together with the Parallels from *Plutarch*! The clearing of the Text and Politics of this judicious Author, would have been an Examination not eaſy to be gone through, even by the moſt learned amongſt us. It would have been a ſingular Novelty in a Youth of common Extraction; but, it was a raviſhing Wonder to us in the Mouth of a *Bertrand de Guéclin*.

The Birth and Progreſs of theſe noble Children are indeed our own Property. We make their Promotion our Buſineſs; nay, we are informed of it as well as of all the Degrees they are made to go through. They, on their Part, are not ignorant of their being under our Eyes; and the Affection, as well as the Number of the Spectators, will always encourage and inſpire Activity and noble Deeds. It is not without great Apprehenſions that they hear us condemn the rough pitiful Politics of *Duprat*: Nor is it without experiencing all the Charms of Utility, that they hear us extol the Uprightneſs of *Amboiſe* and *Sully*, or the beneficial or fruitful Views of the great *Colbert*: The latter of whom, by never giving any Counſels, but ſuch as ſhewed the utmoſt Humanity, or by making the Benefits he beſtowed of univerſal Service, by fixing them on the moſt laſting Foundations, has given the exacteſt Notions of true Glory. This noble Paſſion has, as well as other Virtues, its Meaſure and Standard. It is perfect, when excited by the Spirit of Preſervation; and degenerates, when carried beyond the

Bounds; it then becomes a meer raving Tranſport, downright Ferocity, or an unaccountable Hatred for Mankind. The Favour of a great King and the Applauſes of the People aim at forming intrepid Souls, not at multiplying blood-thirſty Men, or Hearts fond of Piracy and Deſtruction.

Our Nobility think it their ſpecial Duty to love their Country without hating Foreigners. They leave to little People thoſe blind Prejudices in Conſequence of which they are prepoſſeſſed againſt Nations truly eſtimable. The Judgments paſt in a general Manner upon their Characters are moſt commonly deſtitute of Senſe. The worſt Miſtake that can be committed in this Kind is, that of confounding the Idea of Enemies with that of Neighbours. Our Nobility, and I dare ſay, all that are liberally educated among us, have an Abhorrence for this Kind of Injuſtice. Our Nation values itſelf too much perhaps. But it hates not others. The Inſtant our Enemy ceaſes to hurt us, we no longer look upon him as ſuch. We inſiſt upon his Blood, his Purſe, and his minuteſt Intereſts being reſpected and ſpared.

One ſingle Action of the Viſcount *Turenne* may, better than any Diſcourſe, fix the true Aim and Rule of military Conduct in Point of true Glory. The Inhabitants of a conſiderable Town in *Germany*, being informed of the Approach of the *French* Army in their Neighbourhood, ſent a Deputation to the Marſhal to preſent him with a Purſe of a hundred thouſand Crowns, to engage him to direct his March at ſome Diſtance from their Territory. Gentlemen, ſaid he to the Deputies, I am afraid you have loſt your Trouble. I have the Order of my March in Writing. I muſt look; your Town is not to be found there; I have therefore nothing to receive.

This Reply, full of the moſt exquiſite Delicacy, and expreſſive of an amiable Deſire of doing Good, wherever Hoſtilities ceaſe to be neceſſary, ſufficiently evinces the Truth of this Maxim, that *a true Hero is a Friend to Mankind.* His Conduct is never influenced by the Hopes of amaſſing Wealth, or increaſing his Power. To promote our own Intereſt, by breaking through all the Ties of Friendſhip and Humanity, is downright *Machiavelism*, and of conſequence can never conſtitute the Character of a true Hero.

The ſeveral Governments.

There are in the Law, and in the Army, numberleſs Employments and Functions, ſuch as Intendances, ſecret Negociations, Embaſſies, general Diſtricts, Governments of Palaces and Colonies. Commanders of the Sea or Land Forces. All theſe Poſts, and many others, ſuppoſe the ſame Ground of Patrio iſm in thoſe inveſted with them in chief, as well as in thoſe who diſcharge them as Subalterns. But they require ſeveral Degrees of Knowledge, of Elevation of Mind, and of Reſolution according to the Nature of the ſeveral Services. They occaſion the Exertion of many different Talents. The Dawning of theſe is owing to a liberal Education, to the Love of Labour, and a more or leſs extenſive Study of the reſpective Rights and Intereſts of the ſeveral Nations. But the Inſtructions, that will be fitteſt afterwards to improve and confirm theſe Talents, are derived from Practice; and nothing elſe can give a Man a thorough Knowledge of the Art of conducting other Men, and of managing the Springs they are actuated by. But, has he a Mind to employ a ſtill ſurer Method to pleaſe than the Perſeverance of his Labour, than the Judiciouſneſs of his Views, than the Dexterity of his Precautions, than his Affability, and all the Talents which are improved by Exerciſe itſelf? Let him have Probity and Uprightneſs.

But, the Probity here meant is far ſuperior to that commonly boaſted of, which amounts barely to the Fear of diſgracing one's ſelf by baſe Actions, and of ſinking in the Eſteem of Men. A Probity like this is a very faint Degree of Virtue, and unproductive of great Effects. That which I mean is ever active and like itſelf. The Hero, ſeen only by his Valet de Chambre, keeps ſtill to the ſame Conduct he had in the Eyes of the Public. He makes no Step but what conduces to ſome real Good; all his Actions are governed by a lively tender Affection for Mankind.

What we have hitherto obſerved may poſſibly have convinced us, that there is nothing that can make great Men but a Love of this Kind, not only as it checks all Baſeneſs and Injuſtice, but alſo becauſe it is the Source of all

noble

noble Enterpriſes and wiſe Meaſures. The whole Art of Politics may, till we come to the Motives and Helps it borrows from Religion, be as well the Whole of our Morals, ſummed up in this ſhort Epitome;

LOVE MEN, AND THEN DO WHAT YOU PLEASE TO THEM.

This ſo very fruitful Maxim will appear in its brighteſt Light, as we come nearer to the Principle that has put Men under the Government of one among them. Let us paſs over all the Degrees of public Authority and all ſubordinate Governments. Conſider Man in the higheſt of Poſts: And place him on the Throne.

The Art of reigning can be taught leaſt of any. We, by good luck, neither need, or are called to learn it: And it is even to free us from the Cares of Government that we have a King. But we cannot well be indifferent concerning the Bleſſings which Royalty procures us all, any more than concerning the Engagements that bind us to the Throne.

If it is abſurd to treat of War, without ever having commanded or ſerved, it would be ſtill more abſurd to pretend to reduce the Art of governing States into Maxims, without having acquired any Right to it by Experience. God alone makes great Kings, by inſpiring them with great Love for their Subjects: And the beſt Share Subjects can aſſume in the Government, is their getting well acquainted with the Qualities that conſtitute a good People.

The People.

Man is born to govern. He is Maſter of his Actions, and rules as he pleaſes the Things he is poſſeſſed of, as well as thoſe he faſhions through his Induſtry. Whatever leſſens his Domain, or reſtrains his Liberty ever ſo little, ſeems to ſtrike at his firſt Prerogative. Hence that ſecret Oppoſition we make to our being commanded. Even the juſteſt Government ſeems an Infringement on that Liberty with which we were originally inveſted. In effect, though born to live in Society, we were not born to live under Subjection. It is the Introduction of Evil into Society, and the Corruption of the human Heart, that have rendered Authority and the wearing of the Sword neceſſary. The mutual Helps we afford to each other by uniting, would ſoon vaniſh from our Hands through our Imprudence, or be preſently deſtroyed by the unruly Deſires of wicked Men, if that Society was not maintained by the Force and Wiſdom of a regular Government. Our Tranquility has then its Foundation in the Eſtabliſhment of Authority: But what inſures moſt efficaciouſly our Eaſe by the maintaining of Authority itſelf, is the People's being convinced, by powerful invariable Motives, of the Neceſſity of their Obedience.

We in a confuſed Manner conceive the Neceſſity of a Government for the reſtraining of Injuſtice. But, we are not always bound to it by Ties ſufficiently ſtrong: And Philoſophers, who are the readieſt at fixing by Reaſon the Bounds of our Submiſſion, very often become the Diſturbers of Society by the Uncertainty of their Principles.

Conſider the Majority of the Subjects that compoſe a State. They have, for the Sovereign and his Officers, an Indifference no leſs pernicious than that with which they generally look upon every Thing around them. It is a moſt unaccountable Conduct in Men, who love themſelves much, to be forever condemning, as we do, and paſſing Sentence upon thoſe with whom we are to live. However, their Faults are the eternal Matter of our Railleries or Complaints, and we affect a Frankneſs which carefully expoſes their Defects, whilſt we remain cold and full of Reſerve with Regard to their good Qualities. This Piece of Imprudence gradually breaks all Ties; it exhauſts the Source of Services by cooling the Affection, and we ſeldom recur with Confidence to thoſe who have felt the Bitterneſs of our Cenſure. Thus we are all our Lives involved in a Kind of civil War, that deprives us of a Multitude of real Pleaſures and Bleſſings, which we might reciprocally have inſured one to another by a little Indulgence and Taciturnity.

Our Conduct, which is already inconſiderate enough with our Equals, is no leſs ſo with Regard to our Superiors. From the leaſt Exciſeman to the Prime-Miniſter, whoſoever propoſes Orders or Regulations to us, becomes the Occaſion of our Murmurings. They have no other Aim, in what they do, but to circumvent and wrong us: Or, they conſtrain us to no Purpoſe, and merely to make us ſenſible of our having Maſters. Theſe habitual Complaints keep us in an Ill-Humour: And although our Fidelity is not leſſened, our Eaſe is conſiderably diminiſhed by them, becauſe we diſdain to perceive our own Advantages.

An Inhabitant of *Nancy*, who arrives at *Paris* by the Stage, is ſhocked at being deſired at the Gate to open his Portmanteau, and let it be ſearched. The Officer finds among his Baggage a few Pieces of Iron-wear of *Nuremberg*, which he does not return him without Conteſt, and Books of *Leipſic*, which are ſent to the Bookſellers-Hall: He ſhuts up his Mail, and returns to his Coach again with a Face of Diſcontent. What Ways are theſe! What a Government! What a Tyranny! I have on all the Road been a Prey to ravenous Hoſtlers: And, when at my Journey's End, I am aſſaulted by a Legion of Gate-Keepers: Here they have one Rule; there they have another. Why are we not ſuffered to go free, from one End of the Kingdom to the other? Why muſt Liberty be reſtrained for every Trifle? Does not the Law of Nations allow us to dreſs and furniſh our Houſes as we pleaſe? I will, if I have a Mind to it, make a Preſent to a Friend of a *German* Lock, or give a Piece of *Dutch* Linen, or an *Indian* Gown of painted Callicoe to another. I ſhould be glad to have among my Books the *German* Chymiſts and the *Engliſh* Phyſicians. No! I muſt be contradicted in every Trifle. We muſt ſee what you have there. That is prohibited. This Edition is counterfeited. The Privilege of it is at *Paris*. You muſt wait here. I muſt, in ſhort, run here and there to pick up again the Parts of a ſmall Equipage; and yet there is no Certainty for me of having them at laſt for all my Trouble. Such Methods as theſe cannot but be extremely diſagreeable.

Except a few Expreſſions, perhaps, ſomewhat too ſtrong, I have given you Word for Word the Complaints of a Traveller with whom I was ſome Weeks ago, and who ſeemed not over pleaſed to ſee himſelf naturalized among us. He even reproached a Merchant of *Vitry-le-François*, who ſate by him, with his exceſſive Calmneſs.

Sir, replied the eaſy quiet Champaigner, whom a Shower had obliged to get into the Stage again during the Search; give me leave to tell you, that, with great Probity of Mind, you are too eaſily provoked. You will never be happy with that Diſpoſition. I have not ſeen you ſmile ſince the Adventure of the Couple of new-laid Eggs, for which the Innkeeper of *Chalons* made you pay every Farthing as much as he aſked of us to whom he had given a very plentiful Dinner at a very reaſonable Rate. This was the Reſult of your parting from the reſt of the Company. Regulations are made for Men that live in Society; and there is ſome Reaſon in that. It is to no Purpoſe, that the Inn-keeper prepares a Dinner for us, if the Company is not diſpoſed to eat. An Undertaker would to no Purpoſe be at great Charges to keep regular Stage-Coaches from one Place to another, if the King did not render his undertaking ſure of Succeſs by granting him an excluſive Privilege. You and I intend to be in the Flying-Coach of *Lyons* To-morrow. Poſibly the hundred Livres that will be aſked from each of us both for our Fare and Conveyance, will appear to you a Conſtraint; becauſe you love to live after your own Fancy. That's againſt Man's Liberty, you will ſay. But if you conſider Man now, as we formerly did in our Metaphyſics, that will be a Man of another World. Your Man ſtrictly inſiſting upon the Enjoyment of his Rights, will never reach *Lyons*, or elſe a Coach muſt be purpoſely provided for him. No Flying-Coaches, nor any good Eſtabliſhments for ſuch a Man. Whereas, by ſubmitting without Diſpute to the Tax of a hundred Livres, which is not a Farthing too much; were you and I alone in the Coach, it will ſet out to carry two as well as eight Paſſengers. It is the very ſame with the whole Matter of your Complaints at the Gate, and with that of a great many other clamorous Expoſtulations.

The Bounds of human Wiſdom, and the Artifices of Self-Intereſt, will expoſe the beſt Government and the wiſeſt Regulations, to Surpriſes, Inconveniences, or Miſtakes. But thoſe Inconveniences which are ſo much minded, eſpecially when actually offenſive, have nothing in them to be compared to the numberleſs Benefits which the Government procures to a whole Nation, and all the Families of which it is compoſed. Under the Protection of the King, and in Conſequence of the Benefit of the Laws, theſe Families enjoy their reſpective Rights and Poſſeſſions, the Expulſion or total Deſtruction of profligate wicked Men, the Liberty of Tranſportations, the Certainty of public Conveyances, the conſtant Service of Arts and Trades, the daily Supply of Magazines and Markets, the Cleanlineſs of our Habitations, and a hundred other common Eſtabliſhments, which bind us merely to make us the more happy. Yield up our Families to their own private Conduct; they will deſtroy each other by Views ever oppoſite, and incompatible Intereſts. The Want of Communication and Support, of Cleanlineſs, Security, and Uniformity, would not only ſoon give our Habitation an Air of Wildneſs and Ferocity, but bring on the total Combuſtion and Ruin of the State. The Conſequences, naturally reſulting from Independence, make us ſenſible at once how much we are indebted to the King and the Inſtruments that wear the Badge of his Authority. Therefore, honouring the King and his Laws, is working for, or rather loving ourſelves.

This Merchant, whoſe Mind had imbibed all the Principles that conſtitute the true Citizen, went on with comparing together three Sorts of Liberties, viz. one, ſubjected to Laws introduced by long Experience; another, ſuppoſed to be directed by the Opinions of Philoſophers; and, finally, a third, abandoned to the Caprice of private Men. He demonſtrated to us, in a very agreeable Manner, that the latter, which he called the ſavage Liberty, and whoſe Danger was ſelf-evident, was not more hurtful than the philoſophic Liberty, becauſe Opinions and Caprices were much of equal Merit; and that, upon the whole, we had that Sort of Liberty that boaſts of the greateſt Advantages, and is liable to the leaſt Inconveniences. What he told us on that Head, would be much to my preſent Purpoſe: But my ſhorteſt Way is, to have Recourſe at once to that Principle which does undeniably authoriſe one ſingle Man, or but a few Men, to command the Multitude, and binds the Multitude to obey him or them.

This Principle is a real Part of our own Intereſt, and of the ſoundeſt Philoſophy. But if it reſided no where elſe, I ſhould pity both Kings and Nations, to be given over to ſo much Uncertainty. What is in reality the Vocation of Kings?

The ſupreme Governor of a large Society, who maintains it in Order, does the greateſt Thing that can be attempted by the human Mind. To give the Church Prelates well acquainted with the Spirit of it, and the State able Judges that may maintain the Laws and univerſal Polity: To inſure our Navigation and Correſpondences to any Part of the World: To cheriſh the Proſperitity of the Inhabitants of *Quebec* or *Ponticherry*, as much as that of the Inhabitants of *Paris* or *Verſailles*: To moderate by brave Actions, or by judicious Treaties, the Attempts of Powers whoſe Pretenſions are exceſſive, and the Greedineſs of foreign Traders who would overwhelm us with their Commodities, and fetch nothing from us but Money: To promote Education and Sciences: To encourage Agriculture, Arts and Trades, and diſperſe every where the Seeds of Emulation and Conſumption: Such is the Work of a King. He takes all Caſes and Perſons into the Generality of his Laws and bountiful Inclinations. He exerts a Kind of Immenſity. Though on the Throne, he ſeems to be every where: It is, from one End of his Domain to the other, the ſame Spirit, and the ſame Activity. His Name puts every Thing in Motion there, and cauſes Injuſtice to vaniſh, or forces it to hide itſelf. All private Perſons enjoy their reſpective Stations under his Protection, and efficaciouſly call upon him for Redreſs. The Man I ſpeak of is not God; but he is the livelieſt Image of God on Earth.

If any Thing can completely imprint the Character of Divinity on ſupreme Power, it is its being rendered unſhaken. Now the juſteſt Intereſt, any more than the ſoundeſt Philoſophy, is not capable of fixing a Government; the Goſpel alone can do that. If, then, the Security of private Men is ſtrictly connected with the Security and Steadineſs of the Throne, whence the Sovereign keeps every Thing in Order; of courſe the Goſpel, which inſures our Obedience to Kings, is alſo the ſureſt Foundation of the Tranquility of Nations.

They may ſubmit themſelves to the King, either from the Apprehenſion of his Force, or from a conſcious Conviction of the Duty that ties them to him. You are at once ſenſible of the Difference between theſe two Kinds of Obedience. You ſee how uncertain the one, and how unſhaken the other is. Is it Reaſon or Religion that ought to ſettle the Conſcience and work the Perſuaſion on that Head? I believe that Reaſon and Religion go here Hand in Hand.

The Chriſtian Religion gives us the greateſt Idea of the Kings to whom we have ſubmitted and bound ourſelves by Oaths. It makes a vaſt Diſtinction between their Perſons and perſonal Qualifications and their Authority; but it does not diſtinguiſh their Power from the Order eſtabliſhed by God. (a) So that reſiſting Powers is reſiſting God himſelf. (b) The Goſpel declares, that every Soul, without Exception, muſt obey the King and his Miniſters, (c) paying him Honour, Tribute, and Impoſts, not only from the Fear of Puniſhment, but alſo from a Conviction of the Duty. (d) It admits of no Pretence whatſoever, not even that of Irreligion and Idolatry. It bids us to pay the Prince, *Cæſar* himſelf, his Due: *And we ſhould equally renounce the Title of Diſciples of Jeſus Chriſt by being unfaithful to the King, as by being unfaithful to God himſelf.* Thus does the Goſpel ſtrike at the very Root of all Rebellion and Diſobedience. It *powerfully inſures* the public Funds and the Preſervation of the State, by making it as great a Crime to us to refuſe paying that Tribute, as to refuſe paying our Debts.

The Conduct of the Chriſtians, (e) who filled the Country, the Towns, and the Armies of the *Pagan* Emperors during the three firſt Centuries, is the Commentary of the Goſpel. Had they but freed themſelves from their Cruelty by barely deſerting; the Empire would have wanted Ploughmen, Artiſans, and Soldiers; but they all of them remained dutiful: And it is becauſe they underſtood very well the Doctrine of our Saviour, that they

(a) Rom. xiii. 1. (b) Ibid. ver. 2. (c) 1 Pet. ii. (d) Rom. xiii. 5, 7. (e) Tertul. Apologet.

were invariably ſaithful to *Tiberius*, though an Idolater; to *Nero*, though a Perſecutor; to *Julian*, though an Apoſtate. It is plain, that the preaching of the Goſpel, by perſuading large Societies of the Duty that binds them to their Prince, is an eaſy, popular, and efficacious Means of maintaining public Order by the Stability of Kings; and the rendering the Choice of them arbitrary, or their Authority precarious, is being ignorant of the Spirit of the Goſpel, which renders their Perſons and Prerogatives equally ſacred and inviolable.

Does Reaſon give us here Inſtructions as convincing or equally fit to reſtrain Nations? Shall Kings be obliged to depend upon Reaſon more than upon the Doctrine of the Goſpel and the conſtant Example of the Saints?

The moſt preciſe Arguments, that Reaſon ſeems to ſuggeſt on this Subject, are the following. If there is upon the Earth, or in ſome Iſland, but one ſingle Father with the Children he has got by one or more Wives, that Father is, in Fact, and by Right, the ſovereign Judge of that Society. God, who is the Author of Marriage and of the Generation of Children, is alſo the Author of that Principality. It is in order to render it eaſy and infallible, that he ties Parents and Children together with ſacred Knots, which facilitate the Exertion of the paternal Authority. An unnatural Child that ſhould uſe his Father ill, would then reſiſt God's Will. If that haughty Child incroaches upon the Liberty of his Brethren, or even makes Attempts upon their Lives; the Father, in his Quality of Judge, and of Preſerver of the common Tranquility, may, and ought, in that Caſe, to take away the Liberty or even the Life of that ſeditious or murderous Child. If it is allowed to the Children of one or many Wives to cabal and unite againſt their Father, to judge and turn him out, or put him to Death; this will open a Door to Diſaffection and the Love of Novelty. He, who ſhall have ſet himſelf in the room of the diſpoſſeſſed Father, will himſelf be uſed ſtill the more unmercifully by another Male-content. No Stability in the State of that Family; no Order to be hoped for there, if the Majeſty of the common Father does not remain inviolable. Let us now change the Scene.

I ſhall ſuppoſe ſeveral Families to be in one and the ſame Iſland. Their Wants, of whom God is the Author, and the Diſpoſitions, which he has purpoſely implanted in all Men, bring on at laſt the uniting of the Families, in order to be of mutual Aſſiſtance to each other as one ſingle Family. In that Caſe, the Multiplicity of Sovereigns ought to ceaſe with Regard to the Power of the Sword, and the maintaining of the common Order. The Multiplicity of Judges would become a Source of Contradictions and Troubles. If one of the Fathers pretends to puniſh with Death a Criminal who is not his Son, he encroaches upon another Man's Right: He is an Uſurper. If the Caſe of this wicked Child is left to the Deciſion of his own Father, this will prove too weak a Judge. Beſides, there are as many Intereſts, Syſtems and Views claſhing one with another as there are Chiefs. As there muſt be a natural Chief for each individual Family, a Chief of Inſtitution (f) is neceſſary for that large Family conſiſting of many ſmall ones. It wants a Father, or one Society of Fathers; God being the Author of the Wants and natural Diſpoſitions that force Men to live brotherly together, he, of courſe, is alſo the Author of that Sovereign Power which is to maintain Order among Families; and attempting to drive out or kill the King, is deſtroying the Family, and revolting againſt God himſelf: Claiming a Right to ſuch an Attempt is opening the Door to Diſaffection, and putting Arms into the Hands of the Male-contents.

Let us no longer conſider Mankind as wholly contained in one Corner of the World. Let us take Men as they are. It is now a Society that covers the Globe. Are Sovereignties ſtill neceſſary to Men conſidered in this new Light? If both our Glory and Happineſs conſiſt in making Part of that univerſal Society; if it is that Society that makes us enjoy the Earth, as it undoubtedly does; do not our Aſſociations in ſeveral Kingdoms become ſchiſmatical? Is not our uniting in one Body or Town or Republic, breaking with Mankind? Is it not going aſide from, and combining againſt it? It is neither *Paris* nor *Conſtantinople* that ought to be our Country; and, inſtead of expreſſing a warm Zeal for his Country, Man ought always and every where to preſerve the Impartiality of a Coſmopolite.

(f) Pater Patratus.

This would be true, if Man was juſt, and of his Nature capable of extenſive Relations. But the Need he ſtands in of Support, to ſhelter him from Injuſtice, and provide him with Things not within Reach, neceſſarily calls him back under the Laws of a powerful Commonality. There is nothing but a Corporation of this Kind, that can inſure him the collecting of the Fruits of his Country by Means of the ſeveral Profeſſions of the Claſs of the People; that can reſtrain Injuſtice within, and every where maintain good Order and Polity, by Means of the Magiſtrates; that can repel Violence without, by the Miniſtry of military Men; and completely bring under the Hand of each private Man the Productions of the four Continents, by Help of Land and Sea-Commerce. A Man, to whom Birth or Adoption has not procured the Supports of a Country under a regular Government, is at once expoſed to the Inſults of others, and deprived of all the Advantages of Society. He is an Embrio generally abandoned and diſowned; he is a Vagabond that has not a Hole to creep into. When no Commonwealth employs or claims him, he trembling crawls on the Earth, like the Hare that runs defenceleſs amidſt the Hunters, or like the Wolf, whoſe very Sight alarms the whole Country.

When we caſt our Eyes on theſe large Seas that ſeparate the Habitations of Men, the firſt Thought they raiſe in our Mind is, that the Sea is intended to procure an endleſs Separation between them. But the ſecond Thought ſuggeſted by Experience is, that it is the Sea alone that facilitates univerſal Communication. It is the ſame with the particular Aſſociations, that ſeem, at firſt Sight, to contradict the general Union of Mankind, though they afterwards prove to be the true Foundation of that mutual Dependence which makes Men ſerviceable to each other. God, who had appointed Man Lord of the Creation, did not give him to poſſeſs without the Aſſiſtance and Conſent of his Fellow-Creatures. And that the whole Earth might be inhabited and cultivated, he has had recourſe to two infallible Means: Firſt, by dividing them into ſeveral Colonies, by Means of ſo many peculiar Languages, and then by detaining each of them in a different Corner of the World, by another Tie, which is the Love of our Country. We feel within us the ſecret Ties that keep us in, or bring us back to it; and are ſenſible of the ineſtimable Favour of the Diviſion of Languages, which prevents Uneaſineſſes and Deſertions. But, are not ſuch wiſe and efficacious Precautions perhaps the Work of Philoſophy?

The Advantage of Friendſhip.

Such is the admirable Contrivance of divine Providence, thus to have diſpoſed Man to enter into ſmall private Societies, proportioned to his Faculties, to enable him to ſerve Society, and enjoy himſelf the Advantages it offers him. He addicts himſelf to certain Perſons, from a Reſult of the Eſteem he has conceived for either their Talents or their excellent Heart. He acquires Friends; and Friendſhip, whoſe wiſe Counſels make him a Phyſician, or a Counſellor, a good Watchmaker, or an excellent Engraver, is the Unfolder of his Talents; it promotes him in the World, and renders him uſeful to Society. This Kind of Tie in particular is not then hurtful to the whole. If he engages in a religious Order, or a Corporation of Artiſans; he finds there Trials and Regulations that ſettle his Uncertainty, and fix him uſefully to a Kind of Work, which he could not have learned any where elſe, and of which he had not perhaps known the Name. It is then his Quality of an excellent Religious or of an excellent Lockſmith, that renders him ſerviceable to both his Countrymen and Foriegners. But, if he ſhould carry to an Exceſs his Zeal for his Friends, his Corporation, or his Country, we are ever intitled to recal him to the Love of Humanity. Thus are all our Ties and Relations ſubordinate to the Love of Mankind, which we cannot overlook without breaking through our firſt Duty; and without going againſt our deareſt Intereſts. If our Friends have Talents, it muſt give us the higheſt Satisfaction: But it is not our greateſt Intereſt, that others be

The Advantage of Commonalties.

be allowed to have an equal, or even a greater Share of them. We may promote with Affection the Good that may be done by our own Society; but we muſt not croſs the Good that may be done by other Hands, as though it were an Evil. We muſt be cautious of decrying good Works and Workmen, it being both our Duty and Happineſs, not indeed to acquire as many Riches and Honours as can be at the Rate of ſpoiling others, but with Joy to ſee Knowledge, Profit, and Peace promoted in Society.

What we have juſt ſaid of the Benefits reſulting to Mankind from private Societies, proves equally true, and becomes far more ſenſible, with Regard to ſo large a State as ours is. *France* may have ſuch Conduct abroad as will render it ſolidly flouriſhing, by never recurring to Arms, but to vindicate its own Property, and by opening with all Nations a lawful regular Commerce, by which ſhe may reap ſome Advantage, without depriving them of the Profit they may expect to make by her: Or ſhe may, on the contrary, render herſelf worthy of their Hatred, by fraudulent and monopolizing Methods. She may, by taking Advantage of the large Timber which ſhe has at Home, and ſtill greater Plenty in her Colonies, increaſe her Marine, ſo as to ſwallow up all the Profits of her Neighbours. She may make captious Regulations, like ſo many Traps, fit only to prevent People from dealing with her, for Fear of Diſputes and Oppreſſion. She may be ſo intent upon favouring none but the Operations of her own Subjects, that they ſhall make themſelves all the Purchaſes at the firſt Hand, and all the Exportations of the Overplus of their own Commodities. So that her Neighbours may be artfully excluded from her Ports, on Account of the Inutility or Unpleaſantneſs of the Trade they might incline to carry on there.

France may do ſomething more: She may, for Inſtance, ingroſs the beſt Part of the magnificent Commerce of a whole Sea, ſuch as the *Baltick*, and diveſt thoſe whom Nature has firſt intitled to it. A little Dexterity and Vigour will bring this about. She may begin with alarming the North with the Conſideration of the Progreſs of *Muſcovy*. The Arts, the Marine, and War, which begin to flouriſh there; the Conqueſt ſhe has made of the Provinces of *Livonia* and *Aſtracan*; the Tributes ſhe fetches from *Tartary*, a Land above eight hundred Leagues long, and four or five hundred Leagues broad; do not all theſe Things ſummed up beſpeak a Monarchy aiming at univerſal Sovereignty, or at leaſt at the Oppreſſion of the whole North? A Power, that may maintain an equal Balance between the Eſtates neigbouring on the *Baltick*, becomes abſolutely neceſſary. *France* will offer to do this important Piece of Service to the Nations under that Concern. And, in order to ſhelter them efficaciouſly from the dreaded Diſaſter, ſhe ſhall ſend to and keep in the *Baltick* a powerful Squadron, that ſhall make ſure of the Key of that Sea, by wreſting from *Denmark* the Fortreſs of *Cronebourg*. Nor will it be enough that ſhe ſhould be Miſtreſs of the *Sound:* She ſhall provide for herſelf, and make ſure of a ſecond Retreat in the Iſland of *Rugen*, or any where elſe. Theſe Attempts muſt be allowed where the general Balance and the common Security are concerned. *France* may, after theſe obliging Precautions, and upon ſo fair a Pretence, make immenſe Profits in all the above-mentioned Seas and Countries. She ſhall at proper Seaſons carry thither Corn and Wines, her Brandy and Iron, her Flax, Cloth and Stuffs of all Kinds. She ſhall bring back from thence Copper and Maſts, Timber for Ship-building, Tar, Skins and Furs, the fineſt Silks and the beſt Drugs of *Aſia*. We ſhall, in our Quality of Protectors, thruſt ourſelves into all the Quarrels of the Northern Nations. We ſhall block up their Sea-Ports. We ſhall ſtop their Veſſels, with a *Who are you? Send the Boat: What is your Cargo? Open your Parcels: You will be let go when 'tis Time: But, follow us however.* Thus making our Profit of the Knowledge of what paſſes every where, and retarding all the Operations of others by affected Delays, or by Alarms no leſs efficacious, we ſhall make ourſelves ſure every where of the Advantage of the firſt Operations: We ſhall reap the Crop: The others ſhall live by gleaning after us.

The Thing is plain. To render our Society agreeable to Mankind, it is not enough to have avoided the Reproach of being Conquerers; we muſt ſhun likewiſe that of being Monopolizers: Since the conquering Nation will always wreſt fewer Shillings from their Neighbours than the monopolizing People will take Guineas or Louidores from them.

Therefore, both in great and ſmall, among Friends, as well as in Aſſociations of Intereſt, nay, in the exerting of Patriotiſm itſelf, we ought never to wrong, or any how ſtrike at the general Society of Mankind, nor at Humanity. True Honour, true Merit, and every Branch of Duty, unite and center in one Principle, of which we have already felt the Fruitfulneſs and Neceſſity.

LOVE MEN, AND THEN DO WHAT YOU PLEASE TO THEM.

Let us now recapitulate what Reaſon teaches us concerning the Origin and Neceſſity of public Order. Each Family knows its Chief: Nature ſhews him in the Father, who whilſt he has his Senſe and Vigour exerts his Prerogatives and Authorities. He may be aſſiſted by the Counſels and Activity of a judicious eldeſt Son; but ſtill every Rule and Order comes from the Father. In the ſame Manner each State knows its Chief; it is either a Son who ſucceeds his Father, or an immortal Company the departed Members of which are ſucceſſively replaced by others. The Order is now eſtabliſhed; nor was it regulated and confirmed by the Oaths of private Men, for any other Reaſon but to take it out of the Power of any one for the future to trouble the Society by a Love of Change. Thus does every Form of Government become as firm and as reſpectable as Paternity itſelf, which is the Origin and Model of it. It is then a Rebellion and a true Subverſion of the Order of a Republican State, to pretend to ſet one ſingle Family on the Throne there. It is a Rebellion likewiſe, and a Subverſion of the common Good in an hereditary Kingdom, to pretend to ſubſtitute another Family to the lawful Line, or change the Monarchy into a Republic. Men have at all Times, and every where, conformed themſelves to God's Command, by yielding to the Neceſſity that brings them together in one State, and ſubmits that State to common Government.

Thus does Reaſon and Experience teach us, in Concert with the Goſpel, that we ought to love Men as ourſelves, and that reſiſting the Powers, eſtabliſhed for the Preſervation of Men, is reſiſting the Order of God. But, what a vaſt Difference is there between the Impreſſion Arguments may make upon us, and the Influence of the Goſpel over our Minds? I ſhall, for Inſtance, propoſe my Scheme to a Set of Philoſophers, or to a large populous Nation; let us ſee how the Thing will be received. I begin by addreſſing to the Philoſophers.

Hold, hold, will one of them ſay; I ſtop you here upon the Origin of your Sovereignties. The Supreme Power has nothing to do with paternal Authority. One of theſe Things is quite foreign to the other. *Toto Cœlo diſtant.* It was not God, but Oppreſſion, that brought upon us the Yoke of Kings. You are both miſtaken, another will ſay; God, 'tis true, had no Hand in it: But it was a wiſe Counſel, and a Senſe of their Neceſſity that gave Birth to the firſt Inſtitution of Kings. Why recur to God's Counſel, when the Exigency of our Condition is ſufficient? God muſt, indeed, have interfered, ſays a Third, ſince it is He that has ordered Things here below, ſo as to bring us together and ſubmit us to Government. But, you muſt not therefore imagine that God has not allowed Society the Right of Redreſs, that is, the Power of judging their King, when they are ill-governed by him. What will you do with all thoſe Kings that deſtroy each other mutually, ſays an Admirer of *Platoniſm?* Are your Thoughts ſtill buſy about the common Courſe of Monarchies, for the trivial Proceeding of Republics? There will never be any Happineſs upon Earth, if Men are not all of them brought back to a perfect Equality. All theſe Projects of Equality may be good, metaphyſically ſpeaking, replies a *Machiaveliſt*. . . .

But, if I will liſten to twenty-five Philoſophers, this will make twenty-five Opinions to be multiplied by twenty-five Proofs. And what is moſt admirable is, that each Opinion is ſelf-evident, and that all the Proofs are the ſtrongeſt, and moſt peremptory of any. Will you have me engage deeply in the Windings of this Labyrinth?

rinth? I do Juſtice to the Authors of all theſe Syſtems; as I am no Slave to their Thoughts; no more are they to mine. But, if the Royal Power has no better Advocates than the Philoſophers, in this great Variety of Sentiments, the Origin of it will always appear obſcure, and the Principles of our Submiſſion remain ſtrangely confuſed.

What I have ſaid of it ſeems to me ſimple, and profitable for every Man diſpoſed to liſten to it: Let us try the propoſing of it to the People. But, who am I, that I ſhould thus preſume to ſpeak to the Multitude? Upon what Ground can I flatter myſelf that my Thoughts ſhall be better received than another Man's? I have much greater Reaſons to think that I ſhall be liſtened to leſs than another. In vain ſhall I aſſociate myſelf with other Philoſophers who may, if poſſible, have the ſame Notions as I: From what Tribunal, and in what Shape ſhall Philoſophy ſpeak out, and preach up to the People their Duty towards their King? We deliver our Doctrine in Books; but the People read not. Shall we call them together, we that have no Miſſion or Character for that? Nobody would liſten to us, or they would perhaps take us for Fanatics. Philoſophy has in all Ages made Books or verbal Diſſertations. But its Notions will not be received except in Schools: They dare hardly appear, and they would do it to no Purpoſe. Their Look and Proceeding give a Diſguſt to the People, who find nothing but Sound in them. *Plato*'s Republic has been mentioned above two thouſand Years together; and yet the People never made one ſingle Step towards it: They never ſo much as once wiſhed it to be eſtabliſhed. Are they better acquainted with *Machiavel*, or *Hobbes*, or *Bayle*, or *Puffendorf*, or any of thoſe who have philoſophiſed Right or Wrong upon the true *Bonum* of Man and of the Citizen? But with what Reſpect, with what Eagerneſs do we not ſee the People liſten and retain, when the *Meſſiah*'s Deputy ſpeaks from the Pulpit, and when after having demonſtrated to them how the Authority, which *Chriſt* came to exert, firſt by himſelf. and then by his Deputies, is not of this World, and has not altered any thing in the Order of States, he comes to the peculiar unfolding of the Conſequences of this Word; *Render to Cæſar what is Cæſar*'s.

I will not examine here whether the Doctrine of the Goſpel has a proper Claim to our ſtricteſt Attention and Obedience. But, certain it is, that it keeps numerous Societies within the Bounds of their Duties‘ *by the Way of Perſuaſion*, and that it eſtabliſhes Principles of a popular Evidence, that deſtroy all Pretences to Infidelities and Revolts. When whole Nations became philoſophic, we ſee them making perfectly free with the Goſpel and their King. When Paſtors lawfully elected, but given over to their Prejudices, have preached up their Pretenſions againſt crowned Heads, taking Advantage of the Reſpect of the People, they only did it by philoſophical Interpretations; and they were contradicted by that very Goſpel which they never ceaſed to preach. It is the Goſpel, it is the Preaching of the Paſtors of all Ages that has prevailed at laſt, and by a Deciſion of only two Words interdicted all Domineering to *Chriſt*'s Miſſionaries, leaving it entirely to the Maſters of Nations.

Hitherto, Sovereigns, any more than Nations, are but ſlightly beholden to Philoſophy, whereas they have infinite Obligations to the Chriſtian Religion, which can with much greater Efficacy than Philoſophy, or even than Force itſelf, maintain public Order, by ſubmitting to Kings the Hearts of their Subjects.

But, my dear Friend, if Religion is ſuch a vaſt Source of Bleſſings for us in this Life, the Concern we have in it begins to make it dear to us of courſe: And if, beſides the true Foundation of public Order, it ſtill inſures us a bleſſed Futurity, it is equally the Duty of a Citizen and a Chriſtian, to convince himſelf of the Truth of Chriſtianity, and to know why no kind of Truſt is to be given to our philoſophical Syſtems, whilſt the Certainty of the Chriſtian Religion procures us the moſt reaſonable Security.

Your many Queſtions, my dear Chevalier, have engaged me to entertain you with the ſeveral Beauties of Nature, and moſt particularly with the true Excellence of Man, conſidered with Regard to his Knowledge and Underſtanding, or with Regard to the Helps he may be obſerved to borrow from Society. I have looked upon your Deſires as a Law, and have thought my Miſſion in this Reſpect ſufficiently authoriſed. But it is yet very imperfectly fulfilled. Whatever I have ſaid to you is ſtill but profane and uſeleſs, or is hardly more than a Curioſity of meer Amuſement, if it is not enobled by the Certainty of Religion, without which all is tranſitory and frivolous. With it, the very Things that ſlipt from our Hands become permanent. In ſhort, our Inheritance lies there, or we have none at all.

But we need not have Recourſe to Philoſophy or Arguments to know whether we have an Inheritance, that is, a Legacy left us truly and in fact. Reaſon has no other Function here but that of knowing whether we have Vouchers, and Notaries intitled to preſent us with the Depoſition of the Acts and Deeds that make our Privileges good to us. This is a plain Queſtion; which, by removing at once numberleſs Difficulties, refers every Thing to the Certainty of the Teſtimony of our Senſes. It brings every Thing to a Method that ſettles both the Great and the Small, the Wiſe and the Ignorant. Here, my dear Friend, you and I prove to be of one and the ſame Family. Our Vouchers are the ſame. It is the ſame Charters and Deeds, the ſame Depoſitum and Notoriety. This Matter is well worth another Converſation.

A
MEMOIR
ON THE
Fabric of GLASSES at SAINT GOBIN.

WE have avoided in this Memoir a too exact Account of many Meaſures, and eſſential Precautions to be obſerved either in the Structure of the Furnace, or in the Work; becauſe it is juſt to let the Undertakers of this Manufacture keep to themſelves the Knowledge of the Particulars to which they are intitled excluſive of all others.

The Building, where the Glaſſes are run, is called the Hall; which may be eleven Fathoms long, and about ten and a half broad in the Clear. The Furnace is in the Center, and is three Fathoms long, and two and a half wide. It is built of very good Bricks. We ſhall not determine the Thickneſs any more than the Height of its Walls.

There are two Doors three Feet high on each of the Sides, of two Fathoms and a half; and a Door three Feet and a half high on the longer Side. The two former ſerve to throw Wood continually into the Furnace, and the laſt to get the Pots and Pans in and out, as will be taken notice of hereafter. The Figure exhibits three Apertures here, whereas there needed only one.

This Furnace is upon ſolid Foundations, and paved with ſquare Tiles of a well-baked Earth of the ſame Quality as that of the Pots into which the Matter is put to be melted. It is arched within to the Height of ten Feet. The Tube for the venting of the Smoke is in the Center.

On one of the Sides of the Length of the Furnace, and at the Height of three Feet and a half, is the great arched Aperture, ten Feet wide and three Feet high, and ſhaped like the Mouth of an Oven. They through this Aperture put in the Solder and Sand to be melted in the Pots, and through it take out the melted Matter which is carried into the Pan when they are ready to run it.

Round the Furnace are the Walls of the Hall well-built with free Stone: There are in theſe Walls within Apertures like the Mouth of a common Oven; the Hearth of theſe Apertures, which are about four Fathom and a half deep, is two Feet and a half from the Ground-Floor. Theſe ſmall Furnaces are called *Carquaiſſes*, and ſerve to neal the Glaſſes after they have been run.

Theſe Furnaces make ſo many ſmall Buildings round the Hall, and much lower than the under Part of the Roof that covers it. There are without, a like Number of Apertures of the ſame Shape right over-againſt thoſe that are within the Hall; which make a parallel Arch, three Feet high. There are by the Sides of theſe Apertures ſmall arched Niches, with Pipes to give Vent to the Smoke. They light the Fire in them to heat the *Carquaiſſes*. A large Gallery terminates theſe ſmall Buildings, and helps the outward Service of the *Carquaiſſes*.

The Manufacture is compoſed of many of theſe Halls, and of a Multitude of large Rooms, the upper Part of which ſerves to lodge the Workmen. It has fine Buildings to lodge the Maſters, a very pretty Chapel, and wide Yards, many of which are full of Stacks of Wood of ſeveral Kinds. The Compaſs of the Furnace is very large, and incloſed with good ſtrong Walls. The whole is ſituated at the Top of a ſmall Hill, cloſe to the Village of *Saint Gobin*, near *La Fere* and *Chauny*, two Towns in *Picardy*. The Foreſt of *Saint Gobin*, which is of a conſiderable Extent, has given Birth to the Eſtabliſhment of this Manufacture. There are fine Springs in the Foreſt, that ſupply, on the Declivities of the Hill, all the Water neceſſary for the Work. Stone is very good and very common there: They even now and then draw ſome out of the Incloſure of the Manufacture.

The Matter, of which the Glaſſes are made, is a Compoſition of Solder, and of a very white Sand, which is fetched from the Neighbourhood of *Creil*, a Place eleven Leagues diſtant from *Paris*. There are above two hundred People employed round Tables in the Halls, about cleaning and picking the Solder and Sand, to take all extraneous Bodies out of them. After this the Whole is waſhed ſeveral Times, and dried ſo as to be pulveriſed in a Mill, conſiſting of many Peſtles, which are moved by Horſes that turn round with their Eyes blindfold. This done, the Sand is ſifted through Silk-Sieves, and then carried to be dried in narrow Places, contrived in the Corners of the Furnace, four Feet and a half from the Ground Floor, whence it is put into the Pots, to be melted in the Manner hereafter mentioned.

The largeſt Glaſſes are run; the middle-ſized and ſmall ones are blown. I ſhall begin with the Deſcription of the running.

The above-ſaid Furnace is not ſufficiently heated before it has conſumed fifty Cords * of Wood. It is able, after that, to melt the Solder and Sand. It keeps the ſame Degree of Heat, by a continual Supply of Wood. This is done by two Men in their Shirts, who are relieved every ſix Hours. The Furnace is never extinguiſhed but at ſix Months End, in order to be rebuilt. During this Time, they rebuild that which was extinguiſhed before the Furnace actually made uſe of was employed, and make the neceſſary Repairs in both the Hall and the *Carquaiſſes*.

The Furnace contains many Pots formed like Crucibles, three Feet high, and about as much in Diameter, of a well-baked Earth, of a whitiſh Colour, inclining to that of *Tripoly*. Theſe Pots may hold the Quantity of a Hogſhead of Wine, and are very coſtly. Few of them will hold out the full ſix Months of the Furnace's being hot. It happens ſometimes that the Pots break when full of Matter, which is a conſiderable Loſs to the Manufacture.

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* The French Cord is two Cart-Loads.

Theſe Pots being in the Oven, the Solder and Sand are put into them by the Men who run the Glaſſes, who have in Hand an iron Shovel in Form of the Scoop that ſerves to take the Water out of a Boat, and which is full of either Sand or Solder: They paſs one after another before the Maſter-Poker, who puts a ſmall Quantity on each Shovel-ful to facilitate the melting of it by repeating the ſame Mixture till the Pots are quite full. The Solder and Sand remain in the Pot for ſix and thirty Hours together, after which the Matter is fit to be run.

All Hands are now ready for the running of the Glaſſes. They begin by emptying with a large iron Ladle the Matter out of one of the Pots into a Pan, which is put into the Furnace for that Purpoſe. This Pan is of the ſame Earth as that of the Pots, and may be ſix and thirty Inches long, eighteen Inches wide, and as many deep. There are ſome thirty Inches long, with the ſame Depth, and Width as the reſt. There are in the Length of theſe Pans Notches three Inches wide, to ſtop them on the Sides of the Sledge, which is all Iron, and very low: The Tail of this Sledge forms a ſquare kind of Pincers, which when ſhut into the Pan, takes off the Notches. The two Sides of theſe Pincers, ſtretched out in Form of an X, makes the Shaft of the Sledge. The Motion of theſe Pincers is made upon the Axle-tree of the Sledge, where there is a large iron Peg that croſſes it, and is ſtopt with a Pin. They fix the Pan upon the Sledge, with an iron Chain on the Side of the Shaft.

Several Workmen carry the Sledge over againſt one of the heated *Carquaiſſes*, where the Glaſs is to be run upon a Table of caſt Iron, which is horizontal and level with the Hearth of that *Carquaiſe*. This Table is ten Feet long, and five Feet wide, and ſtands ſolid upon a Timber Support.

They put, in a parallel Direction upon this Table, a Couple of flat iron Bars or Rulers, of the Thickneſs intended in the Glaſs, and which ſerve alſo to fix the

Width of it by their Diſtance from each other. They put on the right Side of the Table an Engine in Form of a Crane, which is faſtened to the Wall at Top, and ends at Bottom in a Pivot, to make it turn as Occaſion requires. This Machine is full three Fathom high, its Croſs-Piece a Fathom in length, and its upright Beam eight or ten Inches thick. This Engine is moveable, and they carry it to all the *Carquaiſſes*. It ſerves to lift the Tub above the Table, by Means of a Couple of iron Bars nine Feet long, and forged ſo as to encompaſs the whole Tub, that it may be eaſily inclined, and the Matter run out of it upon the Table. There are four iron Chains to ſupport the Pincer, which unite at a big Rope that runs through a Couple of Pulleys in the Croſs-Beam of the Crane. The whole is liſted up or lowered with a Winch. *

There is at the Foot of the Table a Roller of caſt-Iron five Feet long, and a Foot in Diameter, reſting upon a Couple of Timber-Treſſels. This Roller being laid upon the Rulers or Bars on the Table, they raiſe above the ſaid Table the Pan full of Matter, guided by two Men, who holding the two Sides of the Bars that graſp it like Pincers, cauſe the Pan to ſwing in the Manner of a Sweep, and pour down the Matter before the Roller, which is held by a Couple of Workmen. Theſe People make it roll ſwiftly and in a parallel Situation over the Matter towards the *Carquaiſſe*, and roll it back the ſame Way to bring it to its Place again. They have the upper half of their Body and their Face wrapt up in a thick Packing-cloth, to preſerve them from the Dartings of the Fire.

There are on the three other Sides of the Table ſmall Wooden Troughs full of Water, to receive the Overplus of the Matter juſt run. The Men that run the Glaſſes are twenty in Number at leaſt, and act ſo perfectly in Concert, that the Work is done quickly and without Confuſion, every one having his peculiar Province.

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* Cric is the French Word to be tranſlated here: It is a dented Machine that ſerves Wheel-wrights and Coach-makers to lift up the Wheel of a Coach or Cart from the Ground, to make it turn freely upon its Axle-tree when any Thing is to be mended in it, and to ſupport the Coach on the Side. There are many iron Teeth in a Cric, which move up and down with a turning Handle.

The Running of the Glaſſes is performed in Preſence of the Head of the Glaſs-houſe, and attended by the Overſeer and the Secretary. When the Glaſs is run, theſe Gentlemen examine it, whether there are any Bubbles in it. Theſe are ſmall Places ſhining like Stars when the Glaſs is hot. If any are perceived, the Glaſs is cut directly in that Place; if it is at the third or fourth Part of the Glaſs, the Parts cut off ſerve to make ſmall Glaſſes; when they are but Shards, they are thrown among the Waſte.

The Glaſs being cooled, and declared good, or free from Bubbles, by the Approbation of the Inſpectors, they puſh it off the Table into the *Carquaiſſe* level to it. This is done with an iron Raker as wide as the Table, that has a Handle two Fathoms long.

There are on the other Side of the *Carquaiſſe* without Workmen who with iron Hooks pull the Glaſs to them, and range it in the *Carquaiſſe*, which holds ſix large Glaſſes. When it is full, they ſtop its Apertures with the Doors, which are of baked Earth, and every Chink of them with Cement, that the Glaſſes may be ſmothered and better heated. They remain in that Condition for a Fortnight, and then are drawn out with all imaginable Caution, to be put in Boxes, and ſent by Water to *Paris*, where they are poliſhed.

It may be obſerved, that the Oven-full, or the Quantity of Matter commonly prepared, ſupplies the Running of eighteen Glaſſes, which is performed in eighteen Hours, being an Hour for each Glaſs. The Workmen work but ſix Hours, and are relieved by others, who perform the ſame Operations, tranſporting both the Crane and the Table near another *Carquaiſſe*.

The Manufacture would make vaſt Profits, if the eighteen Glaſſes did all ſucceed, and were all of their intended Meaſure. But there are ſometimes Runnings in which not one of the Glaſſes will be able to preſerve the fineſt Size, which is an hundred Inches in Length and fifty in Width. However I have ſeen many of them ſucceed with theſe Dimenſions.

The laſt Glaſs being run, they ſcour the Pots before they put into the Furnace the Matter of another Running, which is to begin ſix and thirty Hours after the foregoing; ſo that they put the Matter into the Furnace, and begin to run it every fifty-four Hours. The Men who run the Glaſs have nothing to do whilſt the Matter is melting, except thoſe that are appointed to watch the Fire.

Theſe are the Particulars belonging to the Running; let us now ſee thoſe of the Blowing of Glaſſes.

The Hall of the blown Glaſſes is ſmaller than that of the Running: It is made in the ſame Manner, with this Difference, that there are no *Carquaiſſes* round it. But, there is over-againſt the Furnace a large covered Gallery twelve Feet wide, in the Middle of a Building which is above twelve Fathom long: There are all along, and to both the Right and Left of this Gallery, *Carquaiſſes*, the Hearth of which is raiſed four Inches above the Ground-Floor: They are fifteen Feet deep, and their Arches three Feet high, like thoſe of the run Glaſſes. The Furnace here as well as in the Running, is not heated above ſix Months together, ſo that there is a ſecond Hall to perform the Blowing, whilſt they are making all proper Repairs in that at Reſt. The Pots are of the ſame Earth as thoſe of the run Glaſſes. They are ſcoured, and the Matter put in the Furnace in the ſame Manner. The Matter is melting the ſame Space of Time, to be fit for the blowing of the Glaſſes, which are all of them leſs than forty or fifty Inches.

The Workman who blows the Glaſſes when the Matter is melted, takes an iron Cane ſix Feet long and two Inches in Diameter, bored hollow quite through, ſharpened at the End which is put into the Mouth, and widened at the other, that the Matter may adhere to it. He dips his Cane into one of the Pots through the Mouth of the Furnace, and by that Means takes up a ſmall Ball of Matter four Inches in Diameter, which ſticks to that End of the Cane by conſtantly turning it. Then he takes it out and blows a little into the Cane, that the Air may ſwell this Ball of Matter. Next to this, he carries his Cane over a large round Bucket full of Water, and reſting upon a three-footed Support, at the Height of four Feet; then with his Hand he takes Water and ſprinkles the End of the Cane to which the Ball of Matter ſticks, ſtill turning the Cane, that, by this Cooling, the Matter may coaleſce, and make but one Body with the Cane, ſo as that it may ſuſtain a greater Weight.

This Operation being over, he again dips the Cane into the ſame Pot, to take a great Quantity of Matter, ſtill turning the Cane as before; he takes it out, and cools it in the above-mentioned Manner.

He, for the third and laſt Time, takes in the ſame Pot a Quantity of Matter ſufficient to make his Glaſs. He takes the Cane out of the Pot, loaded with Matter, and being in the Shape of a large Pear, which may be ten Inches in Diameter, and a Foot long, he goes to the Bucket and cools it at the Tail; this Cooling is performed more quickly than the other two, not to loſe the Opportunity of the Heat of this Maſs of Matter. He at the ſame Time blows into his Cane, and with the Aſſiſtance of one of the Labourers, gives his Cane a balancing Motion, which cauſes the Matter to lengthen, which by being thus blown and lengthened ſeveral Times over aſſumes the Form of a Cylinder ending like a Ball at Bottom, and in a Point at Top, which ſticks to the Cane only by Means of the ſeveral Coolings already mentioned.

When the Workman has blown ſufficiently, and lengthened his Matter ſo as make it become of an even Thickneſs, he deſires his Aſſiſtant to mount upon a Stool three Feet and a half high, on which there are two ſmall upright Pieces of Timber with a croſs Beam of the ſame, to ſupport the Weight of the Glaſs and Cane, which are kept ſomewhat obliquely by the Aſſiſtant, that the Maſter may, with a Punchion ſet in a wooden Handle and with a Mallet, make a Hole into the Maſs. This Hole is drilled at the Center of the Ball that terminates the Cylinder; it is an Inch in Diameter at moſt.

When the Glaſs is pierced, if there are any Defects in it, they are perceived after this Operation; if it has too many they break it directly, and throw the Matter among the Waſte; if there are none or very few about the Extremities, the Workman goes and lays his Cane horizontally on a little iron Treſſel placed on the Support of the Aperture of the Furnace. He expoſes the Glaſs to the Heat of it for about half a Quarter of an Hour, and then takes it away. In the mean Time the Aſſiſtant mounts the Foot-ſtool again in the former Situation, whilſt the Maſter, with a Pair of long and broad Shears extremely ſharp at the End, widens the Glaſs by inſinuating the Shears into the Hole already made with the Punchion, and by thruſting them more and more into it as it grows wider. Whilſt the Aſſiſtant turns the Maſs of Glaſs, the Maſter goes on with opening of it till the Opening is ſo large at laſt as to make a perfect Cylinder at Bottom.

Next to this the Workman lays his Glaſs upon the Treſſel at the Mouth of the Furnace to heat it. Then he takes it and gives it to his Aſſiſtant on the Foot-ſtool, and with large Shears cuts the Maſs of Matter up to half its Height. If there are any Defects in the Glaſs, it muſt be cut in that Place, as this Section makes the Extremities of it.

There is at the Mouth of the Furnace an iron Tool called *Pointil*, which is heating, that it may unite and coaleſce with the Glaſs juſt cut, and do the Office which the Cane did before it was ſeparated from the Glaſs. This Pointil is a Piece of Iron ſix Feet long, and much of the Form of a Cane; there is at the End of it a ſmall iron Bar a Foot long, laid equally upon the long one, and making with it a T. This little Bar is full of the Matter of the Glaſs about four Inches thick.

This red-hot Pointil is preſented to the Diameter of the Glaſs, which coaleſces directly with the Matter round the Pointil, ſo as to be able to ſupport the Glaſs for the following Operations. This done, they ſeparate the Cane from the Glaſs, by ſtriking a few Blows with a Chiſel upon the End of the ſaid Cane which has been cooled; ſo that the Glaſs breaks directly, and makes this Separation, the Cane being unloaded of the Glaſs now carried by the Pointil.

This done, they preſent to the Furnace the Pointil of the Glaſs laying it on the Treſſel to heat, and redden the End of that Glaſs, that the Workman may open it with his Shears, as he has already opened one End of it to complete the Cylinder, the Aſſiſtant holding it on his Foot-ſtool as before.

They then again, and for the laſt Time, put the Pointil on the Treſſel, that the Glaſs may grow red hot, and the Workman cuts it quite open with his Shears right over-againſt the foregoing Cut. This he does as before, taking Care that the two Cuts make but one and the ſame Line.

In the mean Time, the Man, who looks after the *Carquaiſſes*, comes to receive the Glaſs upon an iron Shovel two Feet and a half long without the Handle, and two Feet wide, with a ſmall Border of an Inch and half to the Right and Left, and towards the Handle of the Shovel. They lay the Glaſs upon it, flattening it a little with a ſmall Stick a Foot and a half long, ſo that the Cut of the Glaſs is turned upwards. They ſeparate the Glaſs from the Pointil, by ſtriking a few gentle Blows between the two with a Chiſel. This done, they carry the Glaſs on the Shovel to the Mouth of the hot *Carquaiſſe*, where the Glaſſes are to be nealed. They take away the Shovel; the Glaſs grows red-hot gradually, by the vaſt Heat which is at the Mouth of the *Carquaiſſe:* The Workman belonging to it takes an iron Tool ſix Feet long, and widened at the End in Form of a Club at Cards, four Inches long and two Inches wide on each Side, very flat and not half an Inch thich. With this Tool he gradually lifts up the cut Part of the Glaſs to unfold it out of its Form of a flattened Cylinder, and render it ſmooth by turning it down upon the Hearth of the *Carquaiſſe*. The ſaid Club being inſinuated within the Cylinder, performs this Operation, by being puſhed hard againſt all the Parts of the Glaſs.

This done, and the Glaſs being quite ſmooth, the Workman puſhes it to the Bottom of the *Carquaiſſe* with a ſmall iron Raker. He ranges it with a little iron Hook. When the *Carquaiſſe* is full, they ſtop and cement it as they do the *Carquaiſſes* of the run Glaſſes; and the Glaſſes remain there alſo for a Fortnight to be nealed. When this Time is over, they take them out to poliſh them.

A Workman can make but one Glaſs in an Hour, and he works but Six together, after which he reſts ſix Hours to begin the ſame Operations a new. He is never at reſt, but when the Matter is melting in the Pots.

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